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BANISTERIA

A JOURNAL DEVOTED TO THE NATURAL HISTORY OF VIRGINIA

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Birds and Natural History Observations in the Life of William Byrd II of Westover

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Chroniclers of early colonial birdlife included Capt. John Smith, William Strachey, and John Clayton, the Rector of Crofton (Rives, 1890; Allen, 1951; McAtee, 1955a,b). In the historical annals of Virginia ornithology, however, neither naturalists nor ornithologists have accorded much if any attention to William Byrd II of Westover (1674-1744). Dr. William Cabell Rives, in his review of the history of Virginia ornithology (1890), briefly mentioned Byrd's accounts of Passenger Pigeons (*Ectopistes migratorius*) and Carolina Paroquets (or Parakeets, *Conuropsis carolinensis*)[1]. J. J. Murray's subsequent treatment of Early Accounts of Virginia Birds (Murray, 1952) repeated Byrd's description of parakeets (see also McKinley, 1978), and in an earlier note (Raven 2 (June): 3, 1932) Murray quoted Byrd's account of the arduous trip through the Dismal Swamp as the dividing line between Virginia and North Carolina was being established.

Since those early brief references to Byrd, more of his writings have been found, in particular several diaries (Wright & Tinling, 1941, 1958; Woodfin & Tinling, 1942; Lockridge, 1987), more accounts of his social, political, and private life (Hatch, 1969; Marambaud, 1971), and a re-examination of the authorship of "William Byrd's Natural History of Virginia" (Adams, 1957, 1962).

The present paper summarizes Byrd's reports of bird observations found in his publications and the now-translated diaries. I have endeavored to locate all of Byrd's references to birds, and have also identified his relationships to contemporary naturalists. Although some people have called Byrd "an amateur naturalist" (Feducia, 1985), "a backward student of experimental science" (Stearns, 1970), and "at best an enthusiastic . . . amateur naturalist" (Frick & Stearns, 1961), such modern-day labels seem to be unjustified because Byrd's diaries and other works reveal a keen sense for details of animal and bird life styles (see, for example, his accounts of Passenger Pigeons, Carolina Paroquets, Wild Turkeys, beavers, opossums, snakes). Surely, Byrd was intensely interested in plants, especially their medicinal properties, as well as potential agricultural and horticultural benefits. At the same time, his broader interests included natural history aspects of colonial Virginia.

A Brief Biographical Sketch[2]

The first William Byrd (?-1704) was a successful Virginia planter-trader who accumulated a fortune, possessed large landholdings on the James River and in North Carolina, and established his family as a power in Virginia. At his death, his Virginia landholdings consisted of 26,231 acres including a fine estate at Westover on the James River about 30 miles from Williamsburg. At Westover he erected a wooden mansion in 1690, and soon laid out magnificent gardens for which he imported plants and bulbs from the Old World. The Westover plantation also contained servants' quarters, extensive meadows, and agricultural fields planted mostly in tobacco. He was proud of his friendship with John Banister, the leading naturalist of Virginia at that time. They shared interests in gardening and horticulture.

William Byrd II was born on 28 March 1674 near the falls of the James River where the city of Richmond would stand one day. At the age of seven he was sent to London for his education. After a brief apprenticeship with a business firm in England and Holland, he entered the Middle Temple in London for legal training, and qualified as a member of the bar in 1695. At 22 he was elected a Fellow of the Royal Society on 29 April 1696, and soon became the most constant link between the Society and Virginia. In that year he returned to Westover, and, through his father's influence, spent a few months representing Henrico County in the House of Burgesses. He returned to London as an agent of the Virginia Assembly to the Board of Trade, and established himself as a strong advocate for the rights of Virginians. Indicative of his growing interest in Virginia's natural history, at the Royal Society in 1697 he exhibited a rattlesnake and an opossum brought from Virginia, both "Strange creatures" to the Society.

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[1] Apparently Rives knew only about the Byrd manuscripts written between 1728 and 1736: "History of the Dividing Line," "Journey to the Land of Eden," and "Progress to the Mines."

[2] Much of the biographical material has been extracted from the books by Bassett (1901), Wright (1940), Hatch (1969), Marambaud (1971), and Lockridge (1987), to which the interested reader is referred for further details of the early Virginia Byrds.

After his father's death in 1704, William took his father's place on the Council of State, became master of Westover, and married Lucy Parke with whom he had four children before she died in 1716. When Lucy's father, Colonel Daniel Parke, died, Byrd assumed his debts, these becoming a financial drain for many years. In 1724, he married Maria Taylor. They also had four children, including William III.

Byrd spent most of the years 1714-1726 in London pursuing his ambition to be made royal governor of Virginia after having openly feuded with Governor Alexander Spotswood, but in 1726 he returned to Virginia to take up again his position on the Council of State and to assume a role as a prominent member of the colony's indigenous political elite. Thereafter Byrd and his fellow members of that elite group steered Virginia with little interference by the Board of Trade in England or the king's governors in the colony.

In 1728, he was chosen to head the Virginia Boundary Commission to survey the dividing line between North Carolina and Virginia. He wrote two accounts of the expedition (see below): a formal document called "History of the Dividing Line betwixt Virginia and North Carolina" (Ruffin, 1841) and a shorter piece, "The Secret History of the Line" which remained unpublished until the 1929 edition of William Boyd. Byrd bought 20,000 acres along the Dan River from one of the North Carolina commissioners, calling it "The Land of Eden." Later he added 110,000 acres to his holdings just south of the North Carolina state line. It was his intention to attract Swiss settlers, a scheme that ultimately failed. In 1736, he headed the commission to survey the Northern Neck, his final service to Virginia beyond his duties as a Councilor, Judge, Colonel of Militia, and trustee of the College of William and Mary.

In "A Progress to the Mines, in the Year 1732," Byrd described a trip to iron furnaces at Fredericksburg, but recorded few natural history observations (Bassett, 1901). Projects then engaging him were schemes to found a city at the falls of the James (which he later called "Richmond") and another at the "Point of Appamattuck River to be named Petersburgh" (Bassett, 1901).

He rebuilt Westover into a brick mansion in 1736, imported fine Georgian furniture, cut glass and silverware, and adorned the walls with paintings, among them the portraits of English lords, earls, and dukes. He was a gifted writer, producing volumes of correspondence, some private and some addressing business and public affairs. His library of over 3,600 titles was the largest in the colony, equaled in North America only by that of his New England contemporary, Cotton Mather. William Procter, a Scotsman, was Byrd's librarian. In his time, he was probably the best-read man in Virginia–law, history, travels, medical works, English literature, Bibles in Hebrew, Greek, Latin, French, Dutch, and English, science and mathematics, architecture, Greek and Latin classics, gardening, and agriculture. Byrd's son, William Byrd III, inherited and possessed the library for over 30 years, but after his death his widow was forced to sell it to pay off debts. Other details of the Byrd library can be found in Campbell, 1851; Houlette, 1934; Wolf, 1958; Smart, 1938.

Byrd had an inquiring mind, devoting much time trying to understand natural remedies for human maladies and writing about natural history (e.g., habits of turkeys, beavers). He improved the Westover garden by adding rare flowers from England, bulbs from Holland, and fruit trees. (On 21 May 1711, Byrd found that "the wild pigeons had eaten all the black-hearts [cherries].") Over the years, he sent many roots, seeds, and herbs to Sir Hans Sloane and the Royal Society especially trying to ascertain their curative properties, and Sloane, in turn, encouraged Byrd to use his servants to collect specimens of Virginia natural products. In 1723, he engaged young John Banister, son of the famous naturalist, to live at Westover and manage the plantation while he was in England. Of the gardens, Beverley wrote (1705): "Colonel Byrd, in his garden, which is the finest in that country, has a summer house set round with the

Indian honeysuckle, which all the summer is continually full of sweet flowers in which these birds [hummingbirds] delight exceedingly. Upon these floweres I have seen ten or a dozen of these beautiful creatures together, which sported about me so familiarly that with their little wings they often fanned my face." Byrd added that "one can take them into his hands and let them fly. They always come back . . . . We cover exceptionally beautiful boxes and jewelry cases with them, and paste them on in flower-and figure shapes" (Beatty, 1932 fide Ewan & Ewan, 1970).

In "A Journey to the Land of Eden in the Year 1733" (Van Doren, 1928), Byrd described a return trip from Westover to the North Carolina properties. Beginning in mid-September, he was accompanied by John Banister, "the kind companion of my travels." On that journey, much of which was in Virginia, Byrd's accounts refer to woodpeckers' habits of piercing the bark of sugar trees "for the pleasure of the sweet juice" (probably the Yellow-bellied Sapsucker, *Sphyrapicus varius*), and to a doe lost "had not the ravens [*Corvus corax*], by their croaking, conducted us to the thicket where she fell."

At the time of his death on 26 August 1744, he was often called the Black Swan (presumably because of his aesthetic interests), was President of the Council of State, and was recognized as the most distinguished and experienced of Virginia's elder statesmen. He owned 179,000 acres of the best land in the colony, hundreds of slaves, herds of cattle, mills, and sloops.

The Dividing Line Expeditions

A quarrel had existed for many years between North Carolina and Virginia as to the dividing line between the two states, so in 1727 King George II ordered the governors to appoint commissioners to survey and make definite the line. Byrd was appointed one of the three Virginia commissioners. The two commissions met at Currituck Inlet on the coast on 5 March 1728, and, with surveyors and other personnel, began to survey the dividing line. Along the way, the commissioners marched around the Dismal Swamp while the survey party had to hack its way through the swamp. By 8 April, 73 miles had been covered, so the commissioners decided to halt at that point and resume operations in September. The survey continued on 21 September, and on 26 October Byrd decided that they had gone far enough to satisfy His Majesty's commission, having traveled 241 miles.[3] Of Byrd's two accounts of the expedition, the "Secret History" (Boyd, 1929) contains more natural history details than Byrd's "History of the Dividing Line" in 1841 (see also Bassett, 1901). Both are invaluable sources of the social history of the time and describe the frontier life and natural resources along the dividing line.

Throughout the expeditions, Byrd's diary entries contained information on plants that might be used for medicinal purposes and animals that could be used for food. Thus, many of the daily entries contain references to wild turkeys, white-tailed deer, and black bears shot for food. Wild turkeys, some "weighing upwards of 40 pounds," are mentioned on 17 days, indicating their abundance along the way. Byrd also recounts the turkey's habit of roosting in high trees, its ability to run fast "like the Ostrich," spring gobbles "by which the Language wherein they make Love," and sharpness of their spurs.

Other birds reported by Byrd on the expeditions were:

- Wild Geese (species unknown, but probably mostly Canada Geese, *Branta canadensis*). On 15 October–"Now the Weather grew cool, the Wild Geese began to direct their Flight this way from Hudson's Bay, and the Lakes that lay North-west of us. They are very lean at their first coming, but fatten soon upon a Sort of Grass that grows on the Shores and Rocks of this River [the Dan]. The Indians call this Fowl Cohunks, from the hoarse Note it has, and begin the year from the coming of the Cohunks, which happens in the Beginning of October. These Wild Geese are guarded from cold by a Down, that is exquisitely soft and fine, which makes them much more valuable for their Feathers than for their Flesh, which is dark and coarse." And on 28 October, as they proceeded to the Roanoke River, "there are many rocks in the river thereabouts, on which grows a kind of water grass, which the wild geese are fond of, and resort to it in great numbers."
- Blue-winged Teal (*Anas cyanoptera*). On 4 October is the entry: "at the distance of five miles we forded a stream to which we gave the name of Bluewing creek, because of the great number of those fowls that then frequented it."

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[3] From a map submitted by the Commissioners, the distance appears to be more on the order of 170 miles.

- "Cranes" probably Sandhill Cranes (*Grus canadensis*). On 9 October–"A great Flock of Cranes flew over our Quarters, that were exceeding Clamorous in their Flight. They seem to steer their Course towards the South (being Birds of Passage) in Quest of Warmer Weather. They only took this Country in their way, being as rarely met with, in this part of the World, as a Highwayman or a Beggar."

A later mention of cranes on 15 October probably refers to herons and egrets: "Six miles further is Crane creek, so named from its being the rendezvous of great armies of cranes, which wage a more cruel war at this day, with the frogs and the fish . . . ."

- Turkey Vulture (*Cathartes aura*). As the surveyors were entering the Dismal Swamp on 17 March, Byrd noted that "neither Bird no Beast . . . came into view. Not even a Turkey-Buzzard will venture to fly over it . . . ." But on 21 March he wrote that the surveyors "espied a Turkey-Buzzard, that flew prodigiously high to get above the Noisome Exhalations that ascend from that filthy place [a cedar-swamp]." He also noted later that carcasses of deer and bear would become "a Certain Prey to the Turkey Buzzards." Then, on 5 October they crossed "Turkey-Buzzard River, from the great numbers of those unsavoury Birds that roost on the tall Trees growing near its banks."

- Ruffed Grouse (*Bonasa umbellus*). On 9 October "Our Indian kill'd nothing all day but a Mountain Patridge [sic], which a little resembled the common Partridge in the Plumage, but was near as large as a Dunghill Hen. These are very frequent towards the Mountains, tho' we had the fortune to meet with very few. They are apt to be Shy, and consequently the Noise of so great a Number of People might easily Scare them away from our Sight."

- Carolina Paroquet. On 26 March–"The Truth is, there is one Inconvenience that easily discourages lazy people from making This improvement [planting orchards]: very often, in Autumn, when the Apples begin to ripen, they are visited with Numerous Flights of paraqueets, that bite all the Fruit to Pieces in a moment, for the sake of the Kernels. The Havock they make is Sometimes so great, that whole Orchards are laid waste in Spite of all the Noises that can be made, or Mawkins that can be dresst up, to fright 'em away. These Ravenous Birds visit North Carolina only during the warm Season, and so soon as the Cold begins to come on, retire back towards the Sun. They rarely Venture so far North as Virginia, except in a very hot Summer, when they visit the most Southern Parts of it. They are very Beautiful; but like some other pretty Creatures, are apt to be loud and mischievous."

- Passenger Pigeon. On 19 October–"The men's Mouths water'd at the Sight of a Prodigious Flight of Wild Pigeons, which flew high over our Heads to the Southward. The Flocks of these Birds of Passage are so amazingly great, Sometimes, that they darken the Sky; nor is it uncommon for them to light in such Numbers on the Larger Limbs of Mulberry-Trees and Oaks as to break them down. In their Travels they make vast Havock among the Acorns and Berries of all Sorts, that they wast whole Forrests in a short time, and leave a Famine behind them for most other Creatures; and under Some Trees where they light, it is no Strange thing to find the ground cover'd three Inches thick with their Dung. These Wild Pigeons commonly breed in the uninhabited parts of Canada, and as the Cold approaches assemble their Armies and bend their Course Southerly, Shifting their Quarters, like many of the Winged kind, according to the Season. But the most remarkable thing in their Flight, as we are told, is that they never have been observ'd to return to the Northern Countries the same way they came from thence, but take quite another Rout, I suppose for their better Subsistence. In these long Flights they are very lean, and their Flesh is far from being white or tender, tho' good enough upon a March, when Hunger is the sauce, and makes it go down better than Truffles and Morels wou'd do."

- Crows (*Corvus* sp.). The only reference that I have found to crows in any of Byrd's writings is an entry on 22 October when they were "encouraged by the good omen of seeing the crows fly over their heads."

Byrd's accounts also contain references to bears, panthers, wolves, buffaloes, beavers, elks, rattlesnakes, and sturgeons.

Based on information gained during the survey, Byrd devised elaborate plans for constructing canals to drain the Dismal Swamp (Swem, 1922). The principal advantage in draining the swamp, according to Byrd, was to provide "the fittest soil in the world for producing hemp." His description of the swamp included vivid accounts of the "quagmire," "overgrown with weeds," with rising "noxious vapours [that] infect the air...giving agues and other distempers to the neighboring inhabitants," where "no beast or bird approaches, nor so much as an insect or reptile," "nor indeed do any birds care to fly over it."[4] Although Byrd later abandoned the plans, they were revived after his death but were never implemented.

The Byrd Diaries

For most of his life Byrd was a diarist. His shorthand diaries that have come to light cover the periods 6 February 1709 to 29 September 1712 (Wright & Tinling, 1941), 13 December 1717 to 19 May 1721 (The London Diary, Wright & Tinling, 1958), and 10 August 1739 to 31 August 1741 (Woodfin & Tinling, 1942).

Each daily entry is usually a short paragraph, and follows a general format: time of arising; reading in Hebrew, Greek, Latin, French; "said my prayers" or "neglected to say"; ate a very sparse breakfast, often only boiled milk; "I danced my dance," evidently calisthenics; morning activities, such as business conferences or writing letters. After an early afternoon dinner, he read, and in the late afternoon or evening, visited servants' quarters where he prescribed remedies to the sick ("bark"-cinchona bark, the source of quinine, blood-letting, purge, sage, snakeroot) or walked about the plantation, often with his wife. On one such occasion, he was "entertained with seeing a hawk which had taken a small bird pursued by another hawk, so that he was forced to let go his prey." Sometimes he took his bow and arrow to shoot at partridges or squirrels. Evenings often included social affairs followed by entries such as "I said [or did not say] my prayers and had good health, good thoughts, and good humor, thanks be to God Almighty."

For dinner meals, he frequently mentioned specific meat courses, these including birds, veal, beef, sturgeon, pork, mutton, eggs, shoat, opossum, and venison. Birds eaten at the dinner meal were:

- "swan." Mentioned once (Nov.).
- "goose" or "wild goose." No common names are given; some might have been domesticated. Mentioned for nearly every month, but most frequently in November and December.
- "blue wing" or Blue-winged Teal. Mentioned 15 times (23 Aug.–8 Oct.)
- sheldrake or canvasback (*Aythya valisineria*). Mentioned twice (Jan., Nov.).
- "wild duck." Mentioned frequently for fall and winter months. January 1741 was exceptionally cold: "some ducks froze to death."
- common snipe (*Capella gallinago*). Mentioned three times (Mar., Aug.)
- "turkey" or Wild Turkey (*Meleagris gallopavo*). A popular dinner item, mentioned 43 times, most frequently in the winter. We do not know whether any turkeys were of the domesticated variety. Certainly Byrd kept and bred chickens and peacocks; one of each was given to Mrs. Harrison in March 1720.
- "partridge," probably the Bobwhite (*Colinus virginianus*). Mentioned for all months except late spring and summer.
- "pigeons" which were probably Passenger Pigeons. Mentioned 55 times, for all months except November and December and chiefly in May and August. Some of the pigeons eaten in the summer might have been Rock Doves (*Columba livia*) because on 11 June 1720 he wrote that a storm had "damaged the pigeonhouse...."

Associations with Contemporary Naturalists

Probably because of his stature in Virginia society, hospitality, and interests in gardens, natural history, and herbal medicines, Byrd became acquainted with many contemporary naturalists, chiefly botanists. Often they would visit Westover for exchange of ideas and tours of his famous gardens. Later he corresponded with these naturalists and sometimes sent plant samples for their use or identification.

Mark Catesby (1682–1749)[5]

Mark Catesby made his first voyage to the New World from his English home, arriving in Virginia in 1712 and remaining for seven years, all the while familiarizing himself with the new plants and animals that everywhere confronted him (Wright & Tinling, 1941). Catesby's sister, Elizabeth, was married to Dr. William

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[4] Today, we know that many species of birds, from waterbirds to raptors to songbirds, breed in or migrate through the Dismal Swamp (Brooke Meanley *in* Simpson, 1990).

[5] fide Feduccia (1985); scholars differ on these dates.

Cocke, Secretary of Virginia and Byrd's friend. Dr. Cocke first brought Catesby to Westover on 30 April 1712. Although Byrd's diary for that period ends in September 1712, over the five-month period Catesby visited Byrd on at least 26 occasions. Through the influence of Byrd and others, Catesby won rapid acceptance among Virginians.

Catesby was the first describer of most of our familiar birds, although such credits are usually given to Carolus Linnaeus (Stone, 1905). Feduccia (1985) notes that Byrd "...brought Catesby into contact with the flora and fauna of Virginia...," and Berkeley & Berkeley (1963) suggested that Byrd was "the ideal person to advise Catesby" in his early explorations. Considering the close association between Catesby and Byrd for seven years, it is likely that Byrd introduced Catesby to many of the common colonial birds even though his interests were primarily botanical. For example, no doubt Catesby's first introduction to the Ruby-throated Hummingbird (*Archilochus colubris*) is found in Byrd's diary entry of 24 May 1712, a month after Catesby's arrival in the New World: "In the afternoon the daughter, Mr. Catesby, and I went into the swamp to see the nest of a humming bird and the Doctor [Cocke] followed along. However we found a nest with one young and one egg in it." Thereafter, plantation walks and other local journeys between them were frequent and included observations of wildlife (the diary contains references to Catesby killing snakes and a bear cub). Byrd's correspondence with Catesby continued until 1737, when he insisted to Catesby that rattlesnakes charm their potential prey by a "steady Look."

After additional trips to the Carolinas and Florida, Catesby completed his renowned *Natural History of Carolina, Florida, and the Bahama Islands*, the first reliable account of North American natural history, including birds (Catesby, 1731–1743) for which Byrd was a patron. For his *Natural History*, Catesby has been called the "Founder of American Ornithology" and "Colonial Audubon" (Frick & Stearns, 1961).

John Banister (1650–1692)

John Banister, the famed early Virginia naturalist and botanist, was killed in 1692 when William Byrd II was 18 years old and living abroad. William Byrd I, interested in exploiting natural resources, had been a patron of Banister as early as 1687 and was probably influential in persuading Banister to come to Virginia (Ewan & Ewan, 1970). Banister probably received information from Byrd I about Indian life, plants, soils, and animal life. In turn, the reputation of Byrd I was enhanced by his association with John Banister.

Banister's son, John, became a frequent companion and employee of Byrd II. In Byrd's "Journey to the Land of Eden 1733," he noted on September 11: "I met my Friend, Mr Banister, who was to be the kind Companion of my Travels," and whom he mentioned as "one of the four *gentlemen* of the party aside from the woodsmen, Negroes, and Indians who made up the expedition."

About 1697, Byrd proposed to the Royal Society and to Sir Hans Sloane, a distinguished British physician and botanist, that a "Fitt person" be sent as a philosopher-naturalist to complete a Natural History of the Colony. Instead, the Society sent William Vernon to Maryland, so Virginia still lacked a naturalist.

John Bartram (1699–1777)

Little is known about Byrd's association with John Bartram (the Colonial Quaker who became known as "His Majesty's Botanist for North America") because thus far no Byrd diary has been found for 1738. In their description of Bartram's travels from Lake Ontario to Florida, Berkeley & Berkeley (1982) recount some of the Bartram-Byrd meetings. As Bartram searched for seeds and new plants on his journey into Virginia, his contacts in Williamsburg urged him to visit Col. William Byrd at Westover because of his renowned gardens, library, and friendship with the famed Sir Hans Sloane of the Royal Society. There, Bartram found another person who shared his intense interest in natural history. Bartram and Byrd inspected the fine garden, with its flower beds, vegetable plots, fruit trees, grape arbors, and greenhouse containing orange trees in fruit. The two also shared interests in prescribing natural remedies for diseases, the use of snakeroot and ginseng, for example. About 1739, Bartram wrote to Byrd about his experiments in crossing white-flowered and red-flowered individuals of *Lychnis*, a campion, hoping that his work would "open a gate into a very large field of experimental knowledge." Other than their shared interests in nature, we know nothing about any exchange of information about animals, especially birds.

John Clayton (1694–1773)

A distant relative of the scientifically-minded Rev. John Clayton (1657–1725), this John Clayton was an affluent farmer-planter, serving as Clerk of Gloucester

County until his death (Berkeley & Berkeley, 1963). His father and Byrd had enjoyed a long association, including visits at Westover, and it is likely that Byrd, his wife's brother-in-law John Custis, and Mark Catesby all influenced the development of young John Clayton into a botanist (Berkeley & Berkeley, 1963). Clayton developed his own botanical garden and corresponded with Byrd and many others about seeds and plants. He became well known to members of the natural history circle on both sides of the Atlantic, especially in his contribution to *Flora Virginica* published in 1739 and 1743.

"William Byrd's Natural History of Virginia"

After unsuccessful attempts to attract Swiss settlers to the Land of Eden, Byrd sold over 33,000 acres to a Swiss agent, Samuel Jenner. In turn, Jenner, in a further attempt to interest his countrymen, published a book in 1737 called "Neu-gefundenes Eden," written in German and allegedly authored by William Byrd. The German version was translated into English and published as "William Byrd's Natural History of Virginia or the Newly Found Eden" by Richmond C. Beatty & William J. Mulloy (1940). These editors insisted (p. xxviii) that "This volume contains the most detailed account in existence of the natural history of colonial Virginia."

The history of this book has been closely scrutinized by scholars who questioned the assertion that William Byrd II was its author. These scholars pointed out that the book lacked the literary qualities of Byrd's prose and that a naturalist better acquainted with details than Byrd had supplied the natural history information.

Critics, such as P. G. Adams (1957), compared "Byrd's Natural History" with accounts in John Lawson's "A New Voyage to Carolina" (1709), and found a striking similarity between the language in the two books (see also McAtee, 1955b). Adams was convinced (1957, 1962) that the author of "Byrd's Natural History" had plagiarized Lawson. The current opinion is, despite the insistence of Beatty and Mulloy, that Samuel Jenner, and not William Byrd, was the principal if not sole author of what is now known as "William Byrd's Natural History of Virginia," and that most of the accounts of the flora and fauna (including those of birds) were in fact taken and reworded from Lawson's book. Adams also points out that some of the later sections of "Byrd's Natural History" were taken from "The History of the Present State of Virginia," written by Byrd's cousin, Robert Beverley (1705). Thus, most if not all of "Byrd's Natural History" pertained to North Carolina and not Virginia.

Summary

William Byrd II of Westover was known as a wealthy landowner and political leader of 18th century Virginia. He had interests in natural products, their curative powers, and frontier natural history. In describing the natural history of colonial Virginia, principally through his diaries, Byrd identified about 20 species of birds and often described their distinctive behavioral traits. For these observations and descriptions, Byrd should be recognized for his contributions to early colonial natural history.

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Apanteles congregatus (Say) (Hymenoptera: Braconidae), a Newly Recorded Parasite of *Tolype* sp. (Lepidoptera: Lasiocampidae)

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Apanteles congregatus (Say) is often mentioned in the literature as a parasite of the tomato hornworm, *Manduca quinquemaculata* (Hawthorn), and the tobacco hornworm, M. *sexta* (L.) (Gilmore, 1938). Krombein et al. (1979) list 15 species of Lepidoptera that A. *congregatus* is known to parasitize. These host species represent two families, Sphingidae and Noctuidae.

On 25 July 1994, a larva referable to the genus *Tolype* (Lasiocampidae) was collected in the Horticulture Garden of Virginia Polytechnic Institute and State University in Blacksburg, Virginia. 30 pupal cocoons of a braconid wasp were observed attached to the caterpillar's dorsal side; after death of the host animal, the cocoons were removed and held until the adult wasps emerged. Both larva and wasps were initially identified at the VPI&SU Insect Identification Lab, and subsequently referred to the Systematic Entomology Lab, USDA-ARS, for verification. The parasites were confirmed as A. *congregatus* and the larva as *Tolype* (identification of these animals to species requires more information on life history and phenology than was available).

This is thought to be the first record of A. *congregatus* parasitizing a species of *Tolype* or any member of the Lasiocampidae. Further study is needed to determine the prevalence of this host-parasite relationship.

Acknowledgements

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Holcocranum saturejae, a Palearctic Cattail Bug Established in Eastern United States and Tropical Africa (Heteroptera: Lygaeidae: Artheneinae)

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One of the most abundant and easily collected seed bugs in the Virginia fauna is a widespread west-Palearctic species which has never been recorded for the New world and which was not found here until July of 1994. *Holcocranum saturejae* (Kolenati) is a well-known inhabitant of the pistillate heads of cattails (*Typha* spp.) which, possibly since its distribution was last summarized (Slater, 1964) has dispersed across the Atlantic and is now known to occur in tropical Africa as well.

The first indication that any member of the Artheneinae was established in North America was a report by Wheeler & Fetter (1987) documenting the discovery and distribution of *Chilacis typhae* (Perrin) in Pennsylvania, Maryland, Delaware, and New York. This apparent obligate commmensal on cattails (*Typha latifolia*) was first found in June 1986, whereupon Wheeler and his collaborators promptly established numerous localities in the four states mentioned later in the same year. The conclusion was drawn that, since C. *typhae* was not found during Claassen's (1922) thorough survey of *Typha* insects in New York State (and could hardly have been overlooked) the species had likely entered the country and become established sometime during the past fifty years.

During preparation of a treatment of the Lygaeidae of Virginia, the first author suspected that *typhae* might occur in at least the northern end of the state, and began to investigate pistillate heads of *Typha* in the summer of 1994. Virtually the first material examined yielded specimens in all developmental stages, as did heads from subsequent collections in a transect across the Coastal Plain and Piedmont regions of the state. Two or three heads from a given site were placed in closeable plastic bags, returned to the laboratory, and "extracted" with low heat (60 watt bulb) in a Berlese funnel. As many as two hundred adults and nymphs could be recovered from a single sample.

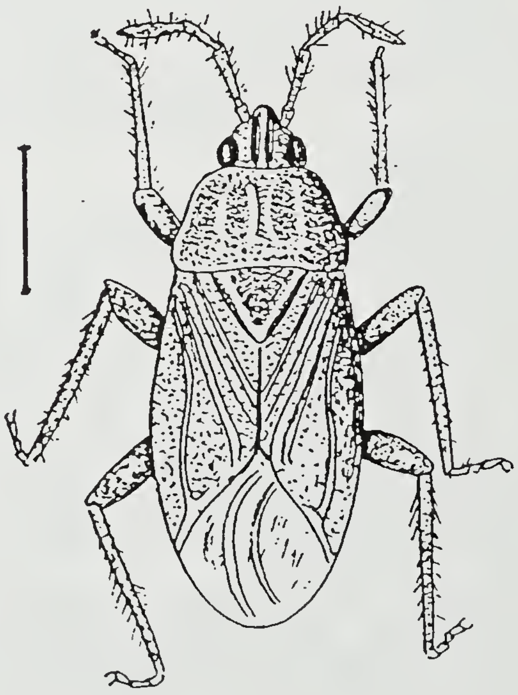

Figure 1. *Holcocranum saturejae*. Bar=1 mm.

However, it was soon apparent that the insects did not exactly match the photograph and descriptive notes published by Wheeler & Fetter for *C. typhae*. Specimens were therefore sent for identification to the second author, who noted their reference to the genus *Holcocranum*. Lacking adequate material of Old World artheneines for comparison, he in turn transmitted the specimens, as well as some apparent conspecifics from tropical Africa, to Jean Péricart (Montereau, France) for his opinion. Dr. Péricart subsequently advised us that all of the specimens are the widespread West Palearctic *H. saturejae*. Thus a second Eurasian cattail inhabitant is confirmed as a well-established immigrant into southeastern United States. The following collection sites in Virginia can be documented (see also the map, Fig. 2), and the establishment of *saturejae* elsewhere along the Atlantic coast is evidenced by material obtained in Florida, New Jersey, North Carolina, and South Carolina. There can be no doubt that it occurs also in Georgia.

Distributional data: Specimens identifiable as *H. saturejae* have been examined from the following localities (collections by the first author unless otherwise specified):

Florida: *Duval Co.*: along US I-95 near jct. with FL Rt. 104, northwest of Jacksonville, 12 October 1994 (J. A. Winston).

SouthCarolina: *Aiken Co.*: S. Fork Edisto River on SC Rt. 302, E of Aiken, 11 March 1995 (A. G. Wheeler, Jr.). *Georgetown Co.*: along US 17 at Pawley's Island, 2 March 1995. *Horry Co.*: along US 17 at North Myrtle Beach, 3 March 1995 (large numbers of all stages, many adults in copula).

New Jersey: *Salem Co.*: NJ Rt. 40, NW of Elmer, 22 August 1987 (A. G. Wheeler, Jr.).

North Carolina: *Columbus Co.*: beside NC 244 in Hallsboro, 2 March 1994.

Virginia: *Botetourt Co.*: Daleville, int. US 220 and Va. 181, 3 November 1994, (M. W. Donahue). *Caroline Co.*: pond beside US 301, 6 mi/10 km N of Dawn, 14 February 1995. *Charles City Co.*: north approach to Benjamin Harrison bridge, Va. Rts. 106/156, 8 mi/13 km W of Charles City Court House, 12 January 1995 (J. M. Anderson). *Charlotte Co.*: Cub Creek floodplain, 2.5 mi/4 km N of Phoenix, 11 August 1994. *Franklin Co.*: county recreation park, 6 mi/10 km SSE of Rocky Mount, 8 October 1994 (J. M. Anderson). *Greensville Co.*: Meherrin River floodplain, 1 mi/1.6 km NE of Claresville, 19 August 1994 (VMNH survey). *Hanover Co.*: beside Va. Rte. 271 at Hylas, 7 September 1994 (W. H. Mitchell). *Henry Co.*: Martinsville, Forest Hill Country Club, August-October 1994; March 1995. *Montgomery Co.*: Blacksburg, VPISU campus, 3 November 1994 (M. W. Donahue and Cheryl Gruver). *Roanoke Co.*: int. US I-581 and Va. 117, 12 November 1994 (M. W. Donahue). *City of Suffolk*: US 58 at Magnolia, 13 September 1994.

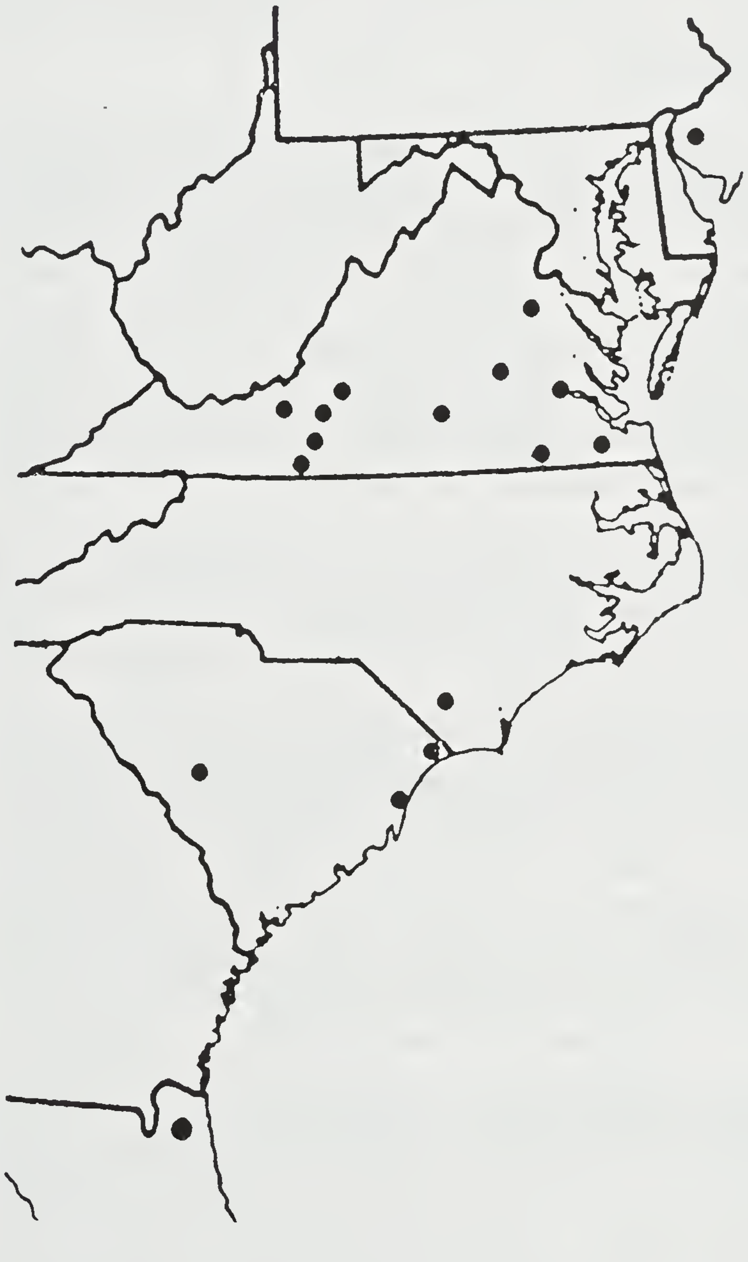

Figure 2. Central Atlantic states, showing all known localities for *Holcocranum saturejae*.

As recently as the end of 1960 (Slater, 1964) there were no published records of *saturejae* in Africa except for the Palearctic belt along the southern Mediterranean rim. However, material in the Slater collection (Péricart det.) originated from the following countries:

Ghana: 2 ♂♂. 2 ♀♀, Tafo, 13 April 1966 (D. Leston), on *Typha australis*.

Nigeria: 2 ♂♂, NE St. Potkiskum, 17 May 1973 (R. Linnavuori).

Chad; 1♂, Adide-Douara, 24 May 1973 (R. Linnavuori).

Tanzania: 1 ♀, Ilonga, 11 October 1964, 1 without abdomen, 4 March 1965, 2 ♀♀, 19 September 1965, 1♂ 2♀♀, 12 September 1965, 2 ♀♀, 2 April 1964, 1 ♀, 4 November 1962, all collected at light trap (I. A. D. Robertson).

This information suggests migratory activity by *saturejae* of truly epic proportions: not only has the species crossed the Atlantic from one or more Palearctic sources, but it has apparently transgressed the Sahara as well, and with outstanding success in colonizing the new territories. It is of course possible that its arrival in both areas is not a recent event but merely one not documented by adequate collecting. Having no baseline studies comparable to Claassen's work in New York, it is impossible to estimate when *saturejae* arrived on the eastern coast of North America nor is the mechanism for dispersal (aeolian, anthropogenic, or other) known. Yet the insects have been able to disseminate themselves widely (usually between minuscule cattail stands many miles apart) and even if nobody previously looked into cattail heads for bugs, it is astonishing that they have not been picked up during dispersal, simply through statistical probability. It seems quite likely that the several areas occupied by the species along the Atlantic Coast represent different entry events, possibly something that could be investigated by molecular techniques.

In the Franklin County sample, *saturejae* occurred with *Chilacis typhae* in a ratio of about 20:1 and the sample from Blacksburg contained 23 *saturejae* and two *typhae*. In a cattail colony 1 mi/1.6 km west of Newcastle, Craig Co., Virginia, only *typhae* was present. These three localities are the only ones so far known for *C. typhae* in Virginia, but suggest that the species may be restricted to the western, upland part of the state, whereas most localities for *saturejae* are distinctly more eastern and lowland. Jean Péricart (MS) notes that in Europe, *typhae* and *saturejae* often occur together, with *typhae* being more abundant, but the reverse seems to be the case in western Virginia.

In the western Palearctic *Chilacis typhae* has a relatively more northern distribution (see Slater, 1964) whereas *H. saturejae* is essentially Mediterranean in range. Until recently five species of *Holcocranum* were reported from the Palearctic Region. Péricart (1994) synonymized three of these with *saturejae*. Distant (1909) described *Teutates sculpturatus* as a new genus and species from India. The genus was synonymized by Horvath (1911) but revalidated by Chopra & Rustagi (1980) on the basis of phallic and spermathecal features, although their paper did not provide comparative differences. To judge from Distant's 1910 figure, this Indian species appears to be a typical *Holcocranum*, and if it is valid, three species are to be recognized: *saturejae* over the Mediterranean region and into western Asia; *diminutum* Horvath in Turkestan (and reported by Linnavuori [1978] from the Sudan); and *sculpturatum* (Distant) from India.

While *H. saturejae* appears to be primarily associated with species of *Typha*, this is not the only plant upon which it develops in Eurasia. Dr. Péricart has kindly allowed us to examine manuscript notes for his forthcoming work on west Palearctic Lygaeidae, which cites numerous records of the species on cattails. However, Putschkov (1960, 1961) established the development of *saturejae* on the catkins of *Salix alba*. It may occasionally inhabit other plants as well.

In Eurasia, hibernation is in the adult stage in litter near water, under bark, and in birds' nests, but our discovery of adults and nymphs inside cattail heads in mid-January demonstrates "in house", active overwintering. Putschkov (1969) has described the nymphs. Details about the biology of the species in North America are unknown, and the mechanism by which individuals get from one cattail stand to another remains a particularly challenging mystery.

Wheeler & Fetter (1986) provided a good description and photograph of *Chilacis typhae*. Specimens of *H. saturejae* are generally similar in habitus (shortened antennae, explanate pronotal margins, etc.) but are distinctly smaller (dimensions), ashy gray in color, with the two black lines between the eyes remaining parallel, and with four polished longitudinal light stripes on the pronotum (Figure 1). Specimens taken in late Fall and Winter are distinctly darker in color than in midsummer, presumably a trait of the second yearly generation.

In the keys to lygaeid genera in Blatchley's manual (1926) and "How to know the true bugs" (Slater & Baranowski, 1978), these two genera work out — with some easements — to *Crophius* (subfamily Oxycareninae). The very short antennae and approximate metacoxae readily distinguish the two artheneines from *Crophius*. Further, they are the only Virginia lygaeids with clear, explanate corial margins in which the posterior half of the wing lies *within* the connexival margins when at rest.

The majority of the Virginia specimens are retained at the Virginia Museum of Natural History. Small voucher series have been dispersed to The National Museum of Natural History, American Museum of Natural History, Cornell University, the University of Kansas, and the collection of the second author. Florida specimens are deposited with the Florida State Collection of Arthropods, vouchers from South Carolina with the Department of Entomology collection at Clemson University, and those from North Carolina in the corresponding collection at North Carolina State University.

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First Virginia Records for Ten Species of Carabidae (Coleoptera)

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The ten species of Carabidae discussed below are new to the list of species occurring in Virginia. Three of them (*Bembidion tetracolum* Say, *Helluomorphoides nigripennis* [Dejean], and *Colliuris ludoviciana* [Sallé]) are recorded from Virginia in the fine new catalogue of Geadephaga of America north of Mexico (Bousquet & Larochelle, 1993). No specific localities are given in that work, but the records are based on the specimens included in this paper. Seven other species — *Piesmus submarginatus* (Say), *Cyclotrachelus incisus* (LeConte), *Calleida viridipennis* (Say), *Zuphium americanum* Dejean, *Pseudaptinus lecontei* (Dejean), *Thalpius dorsalis* (Brullé), and *Thalpius pygmaeus* (Dejean) — are recorded from Virginia for the first time. The specimens examined are housed in the following institutions, abbreviated as indicated: Canadian National Collection (CNC), Carnegie Museum of Natural History (CMNH), and Virginia Museum of Natural History (VMNH).

Bembidion (*Peryphus*) *tetracolum* Say

VIRGINIA. Appomattox County: Bent Creek, VII.18.1980, André Larochelle (5, CMNH and CNC).

This Palaearctic species ranges from Europe to western Siberia and south as far as North Africa (Lindroth, 1945). It was introduced into North America before 1823 (Bousquet, 1992) in both eastern and western Canada (Spence, 1990). It is now nearly transcontinental in the north and ranges south as far as North Carolina, Tennessee and Texas (Bousquet & Larochelle, 1993). The five Virginia specimens were identified by me and verified by Yves Bousquet, and the record in Bousquet & Larochelle (1993) is based on these specimens. Lindroth (1945) describes the habitat in Europe as humid, loamy soil, somewhat shaded, often near water, and in disturbed places such as barns, stables and outhouses. In North America (Lindroth, 1963), it is usually found on damp clayish soil with scattered weeds, mostly in cultivated fields and areas disturbed by man. I have collected this species frequently, and my notes on habitat agree with those of Lindroth.

Piesmus submarginatus (Say)

VIRGINIA. Dickenson County: Breaks Interstate Park, drift fence (pitfall), Site 2, 1780 feet, 22 August-6 October 1991, Virginia Museum of Natural History Survey (1 female, VMNH).

This species has previously been reported throughout the southeastern United States east of the Mississippi as far north as North Carolina and Kentucky (Bousquet & Larochelle, 1993). It has also been reported from Mexico (Blackwelder, 1944; Erwin et al., 1977), but was not included by Ball & Roughley (1982) in their work on Mexican Pterostichini. This is the first record from Virginia. The West Virginia record in Bousquet & Larochelle (1993) is based on a single male collected by Robert E. Acciavatti near Jacksonburg, Wetzel County, not far from the southwest corner of Pennsylvania. I have seen also a couple of specimens from south central Ohio. The species occurs much farther north than was previously known and will probably turn up in Maryland and Pennsylvania. Its presence in Illinois was considered doubtful by Bousquet & Larochelle (1993), but its occurrence in northern West Virginia and southern Ohio suggests it may well be in Illinois, probably near the Ohio River. The Virginia specimen was taken on a relatively dry, east-facing slope of white oak and magnolia with an understory of *Kalmia latifolia* (Richard Hoffman, personal communication). The West Virginia specimen was collected in a moist forested ravine bottom with oak on one slope and beech and maple on the other

(Robert E. Acciavatti, personal communication). Kirk (1969) mentions specimens from South Carolina collected in December and January under dead sweet gum bark and in a dead stump.

Cyclotrachelus incisus (LeConte)

VIRGINIA. Dickenson County: Breaks Interstate Park, drift fence (pitfall), Site 2, 1780 feet, Virginia Museum of Natural History Survey, 30 June-17 July 1991 (1 male, VMNH); 17 July-6 August 1991 (1 male, CMNH); 22 August-6 October 1991 (1 male, VMNH).

This species occurs in the midwest from Arkansas and Oklahoma to Illinois and South Dakota (Freitag, 1969; Bousquet & Larochelle, 1993). Its presence in Virginia is something of an enigma, and it is possible that the eastern specimens represent a vicar species in the C. *incisus* group. Freitag (1969) saw specimens from Allegheny County, Pennsylvania, but considered the records doubtful. The Carnegie Museum has eight old specimens from Pittsburgh and Allegheny County that were presumed to be mislabelled and one from La Porte, Indiana, that was also considered dubious. Casey (1918) described *Anaferonia fausta* from Pennsylvania, and this name is currently listed as a synonym of C. *incisus*. It now seems that perhaps these records are real, especially as Bousquet & Larochelle (1993) record the species from Kentucky and it has now turned up in the far west of Virginia.

I examined the male genitalia of all three Virginia specimens, a specimen from southern Illinois, two specimens from Nebraska, and a specimen ostensibly from Pittsburgh. Comparing Virginia with Nebraska, the genitalia in Virginia specimens are larger (but the beetles are a little larger), more abruptly bent, with the deflections on each side of the apex longer and thicker. The Illinois specimen seems to be intermediate in all three respects. Each of these specimens has a very short right paramere. The aedeagus of the Pittsburgh specimen is nearly identical to the Virginia specimens (large, more abruptly bent, stronger apical deflections), but the right paramere is noticeably longer. All specimens have similar internal sclerites in the internal sacs and the same depression and hump in the apical two-thirds of the aedeagi. I think it is best to consider these differences as variations in local populations of C. *incisus*, at least for the present. Collecting in Ohio and eastern Kentucky may turn up intermediate specimens, or it may show that the gap in range between western and eastern populations is real and not merely an artifact of poor collecting. If the eastern populations are eventually recognized as specifically distinct, it is probable that a name is already available (*Cyclotrachelus faustus* [Casey], mentioned above).

The Virginia specimens were collected in the same habitat as the specimen of *Piesmus submarginatus* mentioned above. Freitag (1969) collected specimens in moist leaf litter in deciduous forest in Arkansas.

Colliuris (*Calocolliuris*) *ludoviciana* (Sallé)

VIRGINIA: Westmoreland County, Oak Grove, VII. 14.1980, André Larochelle (15, CMNH, CNC and VMNH).

This species occurs from New York and New Jersey to Florida and Alabama (Bousquet & Larochelle, 1993), so its discovery in Virginia is no surprise. The Virginia record in Bousquet & Larochelle is based on these specimens. I have collected this species in Florida by treading grasses and carices at the edge of *Typha* patches.

Calleida viridipennis (Say)

VIRGINIA. Amherst County: Lynchburg Reservoir near Oronoco, 7 March 1993, R. L. Hoffman (1 male, VMNH). Chesterfield County: 1 mi/1.6 km W jct US 360 and Va 653, 6 March 1994, S. M. Roble (1 male, VMNH). City of Virginia Beach: Seashore State Park, by cypress pond, 9 January 1990, Kurt A. Buhlmann (1 male, VMNH). Fairfax County: Herndon (1 male, CMNH); Springfield, R. D. Ward, 18–19 April 1976 (1 female, CMNH), 25 April 1976 (1 female, CMNH). Greensville County: 1 mi/1.6 km NE Claresville, 9 May 1993, VMNH Survey, uv light (1 female, VMNH). Roanoke County: Back Creek distr., 2 May 1993, M. W. Donahue (1 male, VMNH).

This species occurs throughout the eastern United States north to New York and Illinois, west to Texas and Arkansas (Bousquet & Larochelle, 1993). These are the first Virginia records. I have collected it only at lights and do not know its true habitat, but it is presumably on trees and vegetation like several other *Calleida*. Kirk (1969) records it from South Carolina under dead pine bark.

Zuphium americanum Dejean

VIRGINIA. Isle of Wight County: 7 km S Zuni, Blackwater Ecological Preserve, pine barrens site, 1 July 1994, S. M. Roble (1, VMNH).

This species has not previously been recorded from Virginia, though it was known from Maryland and North Carolina and is therefore no surprise. It occurs from New Jersey to Florida, west to Oregon and Arizona (Bousquet & Larochelle, 1993). I have collected it only at lights. Kirk (1969) records it from South Carolina in "Jan.-Feb., in hollow tree." According to Reichardt (1977:448), zuphiines "apparently live in humus." It is interesting to note that no Zuphiini had yet been recorded from Virginia. This and the following three species document the occurrence in Virginia of the tribe and all three North American genera.

Pseudaptinus lecontei (Dejean)

VIRGINIA. City of Virginia Beach: Seashore State Park, mesic pitfall site, 26 July 1989, Virginia Division of Natural Heritage survey (1, VMNH); Dam Neck Naval Base, interdunal swale, drift fence site, 14 May 1991, Virginia Museum of Natural History survey (1, VMNH).

This species is known from all the coastal states from North Carolina to Florida to Texas, and also from Arkansas (Bousquet & Larochelle, 1993). These are the first Virginia records for the species and the genus, and they extend the known range significantly northward along the coast. Most specimens have been taken at lights.

Thalpius dorsalis (Brullé)

VIRGINIA. Lunenburg County: Juniper Creek, Virginia Highway 690 at bridge, 10 August 1988, R. L. Hoffman, u-v light (1, VMNH).

This species has been recorded from Arkansas, Texas, Louisiana, Florida and the District of Columbia (Bousquet & Larochelle, 1993). It undoubtedly occurs in all the southeastern coastal states, but its distribution at present remains poorly documented. This is the first Virginia record for the species and the genus. Most specimens have been taken at lights.

Thalpius pygmaeus (Dejean)

VIRGINIA. Isle of Wight County: 7 km S Zuni, Blackwater Ecological Preserve, pine barrens site, 1 July 1994, S. M. Roble, Virginia Division of Natural Heritage survey (2, VMNH).

This species has been recorded from the coastal states from Georgia to Louisiana, and also in Arkansas (Bousquet & Larochelle, 1993). This is the first Virginia record for the species, and it represents a northward extension of at least 380 mi/600 km of the known range. Most specimens have been taken at lights.

Helluomorphoides nigripennis (Dejean)

VIRGINIA. City of Virginia Beach: Seashore State Park, Kurt Buhlmann, 19 May 1989 (3, VMNH), 7 June 1989 (1, VMNH), 21 June 1989 (8, VMNH), 18 August 1989 (6, VMNH), 5 February 1990 (1, VMNH), 22 May 1990 (1, VMNH). Prince William County: Manassas, 23 April 1981, Reed (1, VMNH). York County: Grafton Ponds, Kurt Buhlmann, 11 June 1990 (2, VMNH), 14 June 1990 (1, VMNH), 14 May 1991 (1, VMNH), 27 May 1991 (2, VMNH), 25 June 1991 (1, VMNH).

Some of the earlier records above were sent to Bousquet by Dr. Hoffman, and the Virginia record in Bousquet & Larochelle (1993) is based on these specimens. The species occurs in most of the coastal states from Massachusetts to Texas (Bousquet & Larochelle, 1993). Kirk (1969) records it from "woods trash" and "broomsedge." Nothing seems to be known about *H. nigripennis*directly, but its behavior is presumably similar to the few species of *Helluomorphoides* that have been studied. Topoff (1969) studied *H. latitarsis* and *H. ferrugineus*, and Plsek et al. (1969) studied *H. texanus*. These species are known to search at night and follow chemical trails of ants, or to accompany migrating or foraging columns of ants. They are known to prey on ant larvae and pupae.

Bousquet & Larochelle (1993) record 446 carabids from the state of Virginia, including *Bembidion tetracolum* Say, *Colliuris ludoviciana* (Sallé) and *Helluomorphoides nigripennis*(Dejean). The addition of seven state records published herein brings the documented carabid fauna of Virginia up to 453 species.

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The Centipeds (Chilopoda) of Virginia: A First List

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Introduction

Centipeds are important predators in soil and leaf biotopes, and have evolved a wide variety of sizes and shapes appropriate to their specific niches. The smallest resemble tiny bits of white thread, the largest achieve lengths of more than 300 mm. The class Chilopoda enjoys the dubious distinction of containing the only animals in which the first pair of legs has been modified into a pair of poison fangs that dominate the entire body architecture. The corresponding disposition (of the larger species at least) is such as to have inspired Sir John Lubbock's reference to "the melancholy ferocity" of centipeds.

Despite their somewhat unappealing image, centipeds are extremely interesting animals which have been seriously neglected; much of what we known about their classification, structure, and biology derives from the work of only a dozen or so, mostly European, investigators. Between about 1900 and 1960, study of the rich North American fauna was the exclusive domain of Prof. Ralph Vary Chamberlin (University of Utah), who described the majority of Nearctic species (as well as a great number from other places). Chamberlin was an admitted "alpha taxonomist" whose main interest was naming new species; since he worked simultaneously with spiders and millipeds on a worldwide basis, his research time was spread very thin and did not accommodate a careful and reflective scientific approach. Perhaps the prodigious number of his largely unrelated publications discouraged potential students of centipeds as much as the very refractive nature of their classification, the external structural characters being quite limited as well as cryptic, subjective, and variable. For whatever reason(s), knowledge of American centipeds is not at the point reached by entomologists over a century ago.

At present, research on Chilopoda is effectively handicapped by the fact that virtually *all* of the existing classification must be revised *de* ***novo***, in the context of modern systematic principles. Specific, generic, and familial criteria need to be evaluated and refined, which can be realized only following careful redescription at the species level. A promising start was made in the years 1950–1970 by Ralph E. Crabill, but a long period of illness leading to his lamented demise in 1992 prevented the publication of little more than a tithe of his knowledge. In North America, only Rowland M. Shelley is currently active in centiped taxonomy, and he only in the relatively small order Scolopendromorpha. No synopses of our fauna have appeared since Chamberlin's serial treatment of Lithobiomorpha in 1912–1925 (the Geophilomorpha have never been monographed), and no comprehensive checklist since that of Charles H. Bollman in 1893. It follows that there are no manuals or handbooks for identification at the level of genera and species.

The situation as regards the centipeds of Virginia is a microcosm of what has been outlined above. No list of species known from the state has been published, although a substantial number are recorded in the widely scattered literature. The present attempt at synthesis must be understood as highly provisional and manifestly incomplete, yet a baseline inventory is needed for the simple reason of summarizing existing knowledge, if not to direct the attention of potential students to an interesting and productive field of study.

For several decades I collected centipeds for Dr. Crabill, the majority of them from Virginia; some were deposited in his personal collection, others in the National Museum of Natural History. Following his incapacitation this activity lagged until establishment of the Virginia Museum of Natural History in 1989 provided the motivation and opportunity for renewed studies on the arthropod fauna of the state. Systematic sampling with pitfall and soil extraction techniques has provided extensive material of both known and undescribed species. Some of the chilopods have been identified and reported in, e.g., previous issues of *Banisteria*, but the majority remain unstudied because of pervasive taxonomic problems.

The following annotated list derives from a variety of sources. During the period 1952–1962 Dr. Crabill developed a card catalog for his personal collection (much of which originated in Virginia). In the late 1950's he compiled a state list of 43 species, with records cited by county, based on his material as well as literature records thought to be reliable. That list, made available to me, is the nucleus for what follows, supplemented by information more recently extracted from his card index. Additional records were obtained from specimens sent at various times to Dr. A. A. Weaver, then at the College of Wooster, Ohio. Material at VMNH has been acquired partly from departmental field work, but also in large measure from extensive sampling by the Virginia Division of Natural Heritage, conducted by zoologists Christopher A. Pague and Kurt A. Buhlmann in 1989–1991. Many specimens taken during their personal field activities have been donated by friends of the museum such as Dr. Joseph C. Mitchell (Richmond) and Prof. William A. Shear (Hampden-Sydney). I am much indebted to Dr. Shelley for records of Virginia scolopendromorphs noted by him in American museum collections.

That the majority of records are centered on the western third of the state reflects collection bias, not an impoverished fauna in the Coastal Plain. Future collecting will surely result in better balance in our knowledge of these geographic regions. Improving our knowledge of Virginia centipeds will entail a lot of fine-tuning: species will be added as collections are made especially in peripheral areas, and some will be deleted as junior synonyms or of dubious origin. Some additional undescribed species will surely be found, particularly among the geophilomorphs. Thus the present total of 56 species may be extended to as many as 70, a respectable number for an eastern state in North America. 63 nominal species are known for North Carolina (Wray, 1967) and 45 for Illinois (Summers et al., 1980). Many of the names listed for North Carolina are probably either misidentifications or junior synonyms, especially in the Lithobiomorpha recorded from Duke Forest.

In the following list species which are known from less than 50 miles (80 km) away and likely to occur within the state boundaries are bracketed without prefix number, with an indication of their nearest known occurrence.

Class CHILOPODA

The only recent account in English of the structure and biology of centipeds is that of Lewis (1981). A highly provisional synopsis of the orders and families, with information on biology and distribution was published by me in 1982.

Centipeds are frequently taken in pitfall traps, or may be found under stones or loose bark, or in leaf litter. Most Virginian species may be collected by hand (a moistened fingertip is effective for the smaller species). Only several species of Scolopendromorpha are large enough to inflict a "bite" and such are best taken with forceps. 70% isopropyl or ethyl alcohol is the preservative of choice, but specimens may be collected into tubes charged with ethyl acetate and later transferred into alcohol. Straightening the bodies of geophilomorphs prior to fixation greatly facilitates their subsequent study (these animals often assume pretzel shapes posthumously, making even the counting of legs extremely tiresome). By a perverse twist of evolution, some of the most important details used in lithobiomorph classification occur on the last legs of males, which are readily broken off by clumsy handling during capture. Lithobiomorphs should be seized by the anterior end, the small species by a moistened fingertip (not always easy, since these animals run like the wind when exposed). Specimens taken in pitfalls or with Berlese funnel extraction are generally the most complete and usable.

Order GEOPHILOMORPHA

Autapomorphies of this order include the primary absence of ocelli, high number (30-150) of body segments each provided with pleural stigmata in an uninterrupted sequence, and fixed number of 14 antennomeres. Both familial and generic distinctions are drawn heavily from details of mouthparts, difficult to investigate in species whose total body length is less than 10 mm. The taxa of regional faunas may often, however, be distinguished on the basis of more obvious external details. Geophilomorphs are basically fossorial animals living in deep soil, although frequently found on the surface in litter, or under stones or bark. Our species are mostly some shade of yellow or light red, a few have darker middorsal lines, some are nearly white even as adults.

Family Schendylidae

Most members of this family are tropical, many occur along the seacoast in intertidal biotopes. A number of species, however, are circumboreal in range, restricted to high latitudes or to high elevations southward. Members of our fauna are most frequently collected during the colder months of the year.

1. *Escaryus cryptorobius* Pereira & Hoffman, 1993

Originally described from White Top Mountain, near the junction of Grayson, Washington, and Smyth counties, this species is known also from Buffalo Mountain, Floyd Co., and The Priest, Nelson Co., at elevations ranging from 3500 to 5500 ft.

[*Escaryus liber* Cook & Collins, 1893]

Described from New York, this small species has been recorded from both Maryland and the District of Columbia, making its occurrence in northern Virginia almost a certainty.

2. *Escaryus orestes* Pereira & Hoffman, 1993

The type material of this species was taken in the same soil sample as that of *E. cryptorobius* on White Top Mountain. Unlike that form, however, it has not been found further along the Blue Ridge than Grayson Highlands State Park, about 6 mi/10 km to the northeast in Grayson County.

3. *Escaryus urbicus* (Meinert, 1885)

This species ranges from the Great Lakes region to Massachusetts, thence southward in the Appalachians to Alleghany, Augusta, Bland, Giles, and Nelson counties. It is sympatric with *E. cryptorobius* at The Priest, but otherwise its known Virginia range seems confined to the Ridge & Valley Province.

Family Dignathodontidae

This family (treated in older literature as Linotaeniidae) is largely endemic to the Northern Hemisphere. Most species are recognizable to family by the unusually small head, from which the body gradually increases in width posteriad to about midlength. Our five species are small to moderate in length (15-60 mm), but the crimson *Tomotaenia epileptica* (Wood) of the Pacific Coast region attains a length up to 150 mm.

4. *Agathotus gracilis* (Bollman, 1888)

A small, yellowish species originally described from Jefferson Co., Tennessee, *gracilis* was subsequently collected at Johnson City by Chamberlin in 1910. There is one known Virginia locality, along Va. Rte. 274 about 4 mi/6 km east of Independence, Grayson County, where I found a single specimen on 12 August 1985 (identification by L. A. Pereira).

Wray (1967: 156) records "*Agathotus carolinus* Chamberlin" from Duke Forest, NC. I can find no reference to a validation of this combination, and assume it to be an unpublished MS name supplied by Chamberlin to N. B. Causey or A. S. Pearse. The record, however, does imply that *Agathotus* occurs in the Piedmont and may be present also in southside Virginia.

5. *Strigamia bidens* (Wood, 1862)

This crimson centiped, not uncommon in leaf litter in early spring, is recorded from Alleghany, Bedford, Botetourt, Floyd, Grayson, Montgomery, Nelson, and Tazewell counties, generally above 2000 ft. The record by Chamberlin (1912) for Lynchburg, Campbell County, invites verification.

6. *Strigamia bothriopa* (Wood, 1862)

Existing records suggest that this species occurs at lower elevations than the preceding. Albemarle, Alleghany, Grayson, Henrico, Montgomery, Pittsylvania, Prince Edward, and Rockbridge counties. It is probably statewide.

7. *Strigamia branneri* (Bollman, 1888)

This small tawny species is widespread in eastern United States at low elevations, recorded in Virginia from Albemarle, Montgomery, Patrick, and Pittsylvania counties.

8. *Strigamia chionophila* Wood, 1862

In contrast to the preceding, this likewise small species with reduced segment number is markedly boreal in range, extending from Alaska entirely across Canada and southward along the major mountain systems. Our only confirmed records to date are for Humpback Mountain, Nelson Co., and Potts Mountain, Craig Co., both above 3000 ft. in elevation. At the latter locality, it was found to be common on 22 January 1972.

Family Geophilidae

This, the largest family of geophilomorphs, is essentially worldwide in range and contains some of Virginia's commonest species.

9. *Arctogeophilus fulvus* (Wood, 1862)

The two eastern species of this genus were indistinguishable until their characters were established by Crabill in 1952. *A. fulvus* has been found in Alleghany, Botetourt, Grayson, Highland, and Nelson counties, at localities above 3000 ft. elevation, suggesting a subboreal range in the Appalachians.

10. *Arctogeophilus umbraticus* (McNeill, 1887)

Sharing with the preceding the character of an elongated head sclerite, this species is by far the most frequently collected geophilomorph in Virginia, known from Albemarle, Alleghany, Augusta, Bland, Botetourt, Buchanan, Campbell, Floyd, Giles, Grayson, Louisa, Lunenburg, Madison, Montgomery, Page, Patrick, Pittsylvania, Rockingham, Smyth, Tazewell, and Wythe counties, and the City of Virginia Beach.

11. *Brachygeophilus rupestris* Crabill, 1949

This tiny centiped was described from material collected in western New York state and a sample taken at 4000 ft on Warm Springs Mountain, Alleghany Co., VA, and no additional records have been published. A specimen (VMNH) taken at 3900 ft. on The Priest, Nelson Co., 20 January 1992 (J. M. Anderson) is very likely *rupestris*.

12. *Arenophilus bipuncticeps* (Wood, 1862)

The common member of this genus in southern United States, *bipuncticeps* is recorded from Albemarle, Alleghany, Henry, Mecklenburg, and Surry counties, and the City of Virginia Beach, implying a nearly statewide distribution.

13. *Arenophilus watsingus* Chamberlin, 1912

Somewhat more northern in range, this species is known only from Alleghany, Buchanan, and Pittsylvania counties. Chamberlin stated that his description of *watsingus* was based chiefly on material from Chatham which may thus be considered the type locality.

14. *Geophilus ampyx* Crabill, 1954

A crimson species described from Clemson S. C., *ampyx* is apparently widespread over the southeastern States although localities are not numerous. The only Virginia specimen known to me was found at Cave Spring Recreation Area near Olinger, Lee Co. on 3 September 1972 (det. A. Weaver).

15. *Geophilus cayugae* Chamberlin, 1904

This Appalachian species was reported by Crabill (1954) from Ithaca, New York (the type locality), Mountain Lake, Giles Co., Virginia, and Mount Mitchell, Yancey Co., North Carolina. The Mountain Lake record is based on a sample in Crabill's collection, taken by me on 1 January 1952, along the road north of the Biological Station. VMNH now has material from three additional sites in Virginia: Bedford Co.: Peaks of Otter, 17 December 1994, M. W. Donahue; Grayson Co.: White Top Mountain, 5000 ft., 18 November 1993-16 March 1994, pitfall in beech woods, VMNH survey; Nelson Co., The Priest, 4 mi/6.4 km SW of Montebello, pitfall site at 3900 ft., 20 September–18 October 1992, VMNH survey. The montane-boreal aspects of the species are reflected by its strictly high-elevation occurrence, above 3500 ft., in Virginia.

It is appropriate to record here a substantial extension in the known range of *cayugae*. A sample in Crabill's collection (REC 1835) from Clingman's Dome, Great Smoky Mountains National Park, Sevier Co., Tennessee, 14 June 1954 Howard E. Evans. This locality is approximately 70 mi/130 km southwest of Mount Mitchell.

16. *Geophilus mordax* Meinert, 1886

The taxonomic status of this name is unsatisfactory. Prior to 1954 it encompassed several species, one of which was distinguished by Crabill as *G. ampyx*. In my opinion, another locally-based name, *virginiensis* Bollman (q.v.), seems to be valid and would claim most of the previous records for *mordax* in Virginia. In this restricted sense, *mordax* is known in the state only from material taken by me at Seashore State Park, City of Virginia Beach, 17 April 1951. Quite possibly it will be found to occupy a Lower Austral distribution in southeastern United States.

17. *Geophilus varians* (McNeill, 1887)

Easily distinguished from other local species of *Geophilus* by its unusually long ultimate legs, *G. varians* seems to be widespread across Virginia, with records for Albemarle, Alleghany, Fairfax, Floyd, Greensville, Lunenburg, Montgomery, Patrick, Prince Edward, Rockbridge, and Tazewell counties.

18. *Geophilus virginiensis* Bollman, 1889

This species was described from material taken at Natural Bridge, and so far is not recorded outside this state. Bollman's successors combined the name with the older *G. mordax*, but material which I have seen suggests that *virginiensis* is a valid species differing from *mordax* at least in color: tawny yellow instead of crimson. A review of this problem awaits the accumulation of further study material. At present, specimens considered to be *virginiensis* are known from Brunswick, Charles City, Charlotte, Henry, Lunenburg, and Rockbridge counties, and the cities of Chesapeake and Virginia Beach.

19. *Geophilus vittatus* (Rafinesque, 1820)

The name *G. rubens* Say was incorrectly used for this species for many years. The applicability of Rafinesque's earlier name was shown by Hoffman & Crabill (1953); moreover, Say's name was very likely based on a specimen of what is currently being called *Strigamia bidens*.

G. vittatus is widespread over much of eastern United States, and in Virginia at least is found almost exclusively under the outer loose bark flakes of *Pinus taeda*. It seems to be statewide although there are no records higher than 2000 ft. ASL. Albemarle, Alleghany, Bedford, Brunswick, Fairfax, Halifax, Henry, Isle of Wight, King William, Louisa, Roanoke, and Wythe counties, and the City of Virginia Beach.

20. *Pachymerium ferrugineum* (Koch, 1835)

Whether this small geophilid is native to both Eurasia and North America, or was introduced into this country remains to be established. All Virginia records seem to be from "natural" habitats, usually under stones in low, wet places. Albemarle, Alleghany, Rockingham, and Sussex counties, and the City of Virginia Beach.

[*Sogona minima* Chamberlin, 1912]

The original material of this minute species was found by R. V. Chamberlin at Johnson City, Tennessee, less than 20 mi/32 km from the Virginia state line, which almost guarantees that *minima* occurs in the Commonwealth.

Order SCOLOPENDROMORPHA

Species of this order represent the popular concept of "centipeds" as they are large enough to be easily seen, and in many parts of the world become urban nuisances, entering gardens and homes and often biting people. Three Virginia species are large enough (2-3 inches long) to inflict a temporarily painful injury but one only habitually does so.

All of the Virginia species occur in North Carolina, and are documented in detail in Shelley's treatment (1987) of Carolinian scolopendromorphs, which provides keys, maps, and illustrations.

Family Scolopendridae

Species of Scolopendridae are characterized by the presence of several ocelli each side of the head. A number of species occur in western United States, but only one extends east and north as far as Virginia.

21. *Hemiscolopendra punctiventris* (Newport)

This slaty-blue centiped with deep blue legs and antennae is widespread in the southeastern States, extending northward along the Atlantic Coast to central Virginia and to Kentucky and Illinois in the interior. Generally found in association with decaying pines, the species also has a tendency to invade dwellings and is implicated in unprovoked attacks on human residents (Hoffman, 1994).

In Virginia it extends north only as far as the James River (with two exceptions in Gloucester and Northampton counties), and recurs in the Cumberland Mountain area of the far southwestern counties, as mapped in my

1994 paper. Counties of record include Brunswick, Campbell, Dickenson, Gloucester, Henry, Lee, Mecklenburg, Northampton, Patrick, Pittsylvania, Powhatan, Prince Edward, and the cities of Chesapeake and Virginia Beach.

Family Cryptopidae

All of the members of this possibly polyphyletic family lack ocelli.

22. *Cryptops leucopodus* (Rafinesque, 1820)

As pointed out by Hoffman & Crabill (1953) the name *leucopodus*, based on material from Kentucky, seems clearly referable to *Cryptops*. Whether it is a senior synonym of the familiar name *hyalinus* (Say, 1821) cannot be assumed prior to a thorough revision of the genus, since Say's name seems to have been based on Floridian material which perhaps represents a distinct southern species. Although the Virginian form is sometimes taken in Berlese extractions of leaf litter, its preferred habitat is clearly beneath the loose bark of downed tree trunks in broadleaf forests. Instate records are rather sparse and mostly in the western half even though *leucopodus* probably occurs in every county. Alleghany, Bland, Botetourt, Floyd, Montgomery, Nelson, Nottoway, Prince Edward, Rockbridge, and Washington counties.

23. *Theatops posticus* (Say, 1821)

The two local species of *Theatops* are distinguished by their greatly thickened posterior legs, which function as forceps (certainly in defense, and possibly in prey-capture although hunting techniques have not been observed in the genus). In my experience, *posticus* is usually found under deeply imbedded stones; the species almost never is taken in pitfall traps nor found under loose bark. As in North Carolina, it is widespread over much of the state, with records from Albemarle, Alleghany, Botetourt, Buchanan, Floyd, Greensville, Henry, Lee, Montgomery, Page, Patrick, Pittsylvania, Rockbridge, and Rockingham counties. The scarcity of Coastal Plain localities is noteworthy, however.

24. *Theatops spinicaudus* (Wood, 1862)

Somewhat more abundant south and west of Virginia, this species has not previously been recorded from the state, and apparently occurs only along the southern tier of counties. VMNH has single specimens from Scott County: 1.5 mi/2.4 km E of Shelleys, C. A. Pague 2 May 1989, and Carroll County: Stewart's Creek SGNMA near Lambsburg, 23 May 1993 and New River Trail State Park, 3 mi/4.8 km N of Fries, 18 September 1988, both taken by me. The Stewart's Creek site is at the base of the Blue Ridge, and presages capture of the species in the western Piedmont, where it occurs also in North Carolina (Shelley, 1987, fig. 13).Probably, *spinicaudus* will be found in Lee, Washington, and Wise counties. Both of the Carroll County specimens were found under deeply embedded stones, one in loose damp soil, the other in dry cinders along an old railroad bed.

25. *Scolopocryptops nigridius* McNeill, 1887

This is a moderate-sized member of the genus, attaining a length of about 50 mm. It has a distinctive greenish brown to mahogany body with somewhat reddish head capsule and a relatively mild disposition: specimens can usually be picked up without risking a bite. The species is widespread over much of Virginia, and frequently taken in damp leaf litter. Curiously, I have never found a female brooding eggs or hatchlings; nursery duty is apparently conducted in deep soil in contrast to the situation in *sexspinosus*. Records are at hand for Albemarle, Alleghany, Botetourt, Buchanan, Dickenson, Floyd, Franklin, Giles, Grayson, Greensville, Henry, Isle of Wight, Lunenburg, Mecklenburg, Montgomery, Nelson, Patrick, Pittsylvania, Prince William, Rockbridge, Rockingham and Washington counties, suggesting a statewide distribution except for the Eastern Shore and possibly the outer coastal plain.

26. *Scolopocryptops peregrinator* (Crabill, 1952)

This taxon was first described as a subspecies of the western S. *gracilis* (Wood), from two specimens taken in Maryland and Virginia (the type locality is Charlottesville, Albemarle Co.). Recently it was elevated to full species status by Shelley (1987), who reviewed the mid-Appalachian distribution on the basis of all specimens known to him. It is certainly a more secretive animal than its local relatives, and collections have relatively few specimens. Perhaps *peregrinator* is more fossorial, as suggested by its pallid coloration: a pale yellowish in the few specimens I have found. The known Virginia localities are within the area already defined by Shelley, a few of them being additions based on material not accessible to him: Albemarle, Alleghany, Botetourt, Frederick, Montgomery, Patrick, Pulaski, Rappahannock, and Tazewell counties. A specimen in Crabill's personal collection (1655) extends the known range of the species somewhat further to the northeast in Pennsylvania: Monroe Co.: Delaware Water Gap at Shawnee, G. E. Ball 11 September 1953. Possibly *peregrinator* will eventually be found in adjacent parts of New Jersey and New York as well.

27. *Scolopocryptops sexspinosus* (Say, 1821)

A species of superlatives: Virginia's largest centiped, the most widespread, and perhaps the one most often seen. Old adults may attain a length of nearly 65 mm (2.6 inches) when alive and running. The color is somewhat variable, but typically orange to orange-red, rarely reddish-brown. It is a species of leaf litter and rotting logs, very rarely found under bark or embedded stones. During the summer months, females are often discovered in rotting wood, coiled about their eggs or recently hatched young, which they protect from potential predators (and, possibly, from fungal growth). *S. sexspinosus* is the centiped most often caught in pitfalls, suggesting pervasive nocturnal activity although I have never seen one on the surface, despite years of night collecting. So far as I know *sexspinosus* does not enter dwellings. It occurs with equal abundance at Seashore State Park at sea level and at the top of Mount Rogers, around 5700 ft. (and to 6600 feet at Mount Mitchell, N.C.). It is far more common than the following records imply, perhaps because collectors not equipped with forceps are reluctant to attempt hand-capture of the swift-moving, formidable animals. The following county records are available: Alleghany, Augusta, Botetourt, Buchanan, Dickenson, Franklin, Giles, Grayson, Greensville, Henrico, Lee, Mecklenburg, Madison, Montgomery, Nelson, Page, Patrick, Pittsylvania, Rockingham, Tazewell, Wise, and York counties, and the City of Virginia Beach. Perhaps the species does not occur on the two Eastern Shore counties.

Order LITHOBIOMORPHA

Species of this order are relatively short-bodied animals with 15 pairs of legs. Many are minuscule (less than 10 mm long) residents of leaf litter habitats and tend to be overlooked by all but the most patient and knowledgeable collectors. Extraction of litter samples with a Berlese apparatus is often much more effective than hand-picking and yields specimens in far better condition.

Essentially all of our knowledge of this order in North America came from the hand of R. V. Chamberlin who treated it in a series of generic revisions published from 1912 to 1925. Despite such imperfections as the lack of a key to genera, his pioneering work on a large, diverse, and little-known fauna has to be considered a tour-de-force, of a quality never approached in Chamberlin's later work. However, he placed inordinate emphasis on plectrotaxy of the legs, to the extent that even single differences in spur placement were used to distinguish species. Almost certainly, many of the nominal species established by Chamberlin in these and later papers will be reduced to the rank of subspecies or abolished entirely, especially those based on single specimens. The following list of lithobiomorphs known from Virginia will surely be greatly altered as our knowledge increases; even in its present incomplete form these animals comprise half of the state's chilopod fauna..

Family Henicopidae

Henicopids seem to be the surviving members of an old generalized lineage, widely dispersed over the earth in distinctly disjunct, fragmented ranges. Lacking the regular and elaborate plectrotactic characters of lithobiids, and without modification of male legs, these centipeds are not easy to distinguish and our knowledge of the group in North America is especially deficient.

28. *Zygethobius pontis* Chamberlin, 1911

The type material of this Appalachian endemic was taken at Natural Bridge in 1910 by Chamberlin himself; he had found specimens also at Johnson City, Tennessee. The species is not rare in western Virginia, and often is taken in pitfall traps as well as by hand-collecting in leaf litter (usually in the cooler months of the year). VMNH has material from Augusta, Dickenson, Floyd, Giles, Grayson, Highland, Nelson, Rockingham, Smyth, Washington, and Wise counties, suggesting a general distribution in the mountainous part of the state (and by implication, in adjoining parts of Kentucky, West

Virginia, and North Carolina, for which states there appear to be no published records).

29. *Lamyctes pius* Chamberlin, 1911

The range of this nominal species extends from the mountains of North Carolina northeastward as far as Philadelphia. So far the only Virginia record known to me is a single collection (USNM, Crabill det.) from Blacksburg, Montgomery Co., but the species must be generally distributed in the western half of the state.

[*Lamyctes fulvicornis* Meinert, 1868]

This introduced European species is widespread across most of North America in urbanized habitats, and surely will be found in most of Virginia's cities.

Family Lithobiidae

With about 80 nominal genera and over 1400 "species" worldwide, the Lithobiidae is by far the largest family of Chilopoda, and almost exclusively distributed over the Northern Hemisphere. In the past, both genera and species were defined on the basis of trivial differences in the distribution of spurs on the podomeres, with additional appeal to number of prosternal teeth and antennomeres, and to whether various terga were caudolaterally produced or not. The taxonomic significance of such variables remains unresolved and at present, it is very difficult to assess the validity and status of most American lithobiids.

In our fauna, lithobiids range from about 6 to 30 mm in length; larger species often occur under loose bark and ground shelter in dry places; smaller forms are to be found chiefly in leaf litter and are readily captured by extraction of litter samples in Berlese apparatus.

Nearly a score of lithobiids have been described from, or reported from, the Duke University Forest, a number of isolated woodlands located west of Durham in Durham and Orange counties, North Carolina. These species were described more or less contemporaneously in the early 1940s by Nell B. Causey and R. V. Chamberlin, and it is not known to what extent their respective names may be redundant and synonymous. It does not, however, seem likely that 25 species of Lithobiidae actually occur in that local faunule. Causey's type material appears to be lost; at least some of Chamberlin's is at the National Museum of Natural History. Until extensive sampling of the Duke Forest has been conducted, and a reasonable concept of the actual diversity gained, these various lithobiid names will remain a source of confusion and uncertainty. Since Durham is only 33 mi/53 km south of the state line, it is almost certain that any centipeds native there will also occur in Virginia's "Southside" counties. To some extent, this has been established, by the collection here of such nominal taxa as *Nampabius mycophor*, *Sozibius carolinus*, and *Serrobius pulchellus*. For the present, all of these nominal taxa are registered without prejudice as possible members of the Virginia fauna.

30. *Bothropolys multidentatus* (Wood, 1863)

The largest native lithobiid, this corticolous species is also one of the most abundant and frequently collected. Counties of record include Alleghany, Augusta, Botetourt, Floyd, Franklin, Giles, Grayson, Henrico, Henry, King George, Madison, Montgomery, Nelson, Pittsylvania, Rockbridge, Rockingham, Scott, Wythe, and York, and the cities of Suffolk and Virginia Beach.

[*Zygethopolys atrox* Crabill, 1953]

This species was described from Cumberland Falls, Whitley Co., Kentucky. As this locality is only 42 mi/67 km west of Cumberland Gap, the natural occurrence of *atrox* in the Virginia fauna must be considered as likely.

31. *Lithobius forficatus* (Linnaeus, 1758)

The status of this species as native to North America or a widespread and successful immigrant remains uncertain. The latter possibility seems supported by the origin of most records from developed regions. In Virginia, it is common under stones in gardens.

[*Lithobius atkinsoni* Bollman, 1887]

This apparently native Appalachian *Lithobius* was found by Chamberlin as far north as Hot Springs, NC, 50 mi/80 km below the state line and is thus a likely candidate for inclusion in the Virginia fauna.

32. *Neolithobius latzeli* (Meinert, 1885)

This rarely collected centiped is known with certainty only from Piedmont North Carolina and southwestern Virginia: Mecklenburg, Montgomery, and Washington counties. A detailed historical account of the species and its initial collection will appear in a subsequent issue of *Banisteria.*

33. *Arenobius manegitus* (Chamberlin, 1911)

Arenobius is the northeasternmost representative of a group of related genera centered in the southwest and Gulf Coast regions, and *A. manegitus* is fairly widespread in the southern and central Appalachians. Virginia records are for Floyd, Montgomery, Smyth, and Washington counties. The species is not uncommon at Blacksburg, its easternmost locality.

[*Garibius branneri* (Bollman, 1888)]

Described from Jefferson Co., TN, and subsequently collected by Chamberlin at Brown's Summit, Guilford Co., NC. As the latter locality is only 27 mi/43 km south of the state line, *branneri* may reasonably be expected to occur in Virginia.

[*Garibius georgiae* Chamberlin, 1913]

Reported from the Duke Forest, although whether correctly identified is unknown.

[*Garibius monticolens* Chamberlin, 1913]

Like G. *branneri,* also recorded from Brown's Summit and equally likely to extend north into Virginia.

34. *Garibius opicolens* Chamberlin, 1913

Described from New Jersey and adjacent Pennsylvania, this species appears to be nearly statewide in Virginia, recorded from Alleghany, Mecklenburg, Rockingham, and Tazewell counties, and the city of Virginia Beach. It seems to occur preferentially under the loose bark of downed trees.

35. *Garibius pagoketes* Chamberlin, 1913

The type locality is in western Massachusetts. The two Virginia counties of record appear to be the southernmost known for the species: Alleghany (Crabill det.) and Grayson (Weaver det.). Crabill (1957) considered *pagoketes* to be a junior synonym of *opicolens;* Weaver (unpublished) believes that the two can be kept apart. Pending a more systematic treatment of the problem, I continue to list *pagoketes* in a probationary status.

36. *Garibius psychrophilus* Crabill, 1957

This species is known only from western Virginia. The type locality is in Blacksburg, Montgomery Co., and unreported material in the Crabill collection is from adjacent Giles County: Mountain Lake, 3 May 1959, Crabill and Hoffman.

[*Llanobius chamberlini* Causey, 1942]

Duke Forest, the type locality.

[*Llanobius dux* Chamberlin, 1940]

Described from Duke Forest, and possibly a senior synonym for the preceding species?

37. *Nadabius aristeus* Chamberlin, 1922

Apparently an Appalachian species, *aristeus* has been recorded from New York, New Jersey, and Massachusetts, and all of the known Virginia localities are on or west of the Blue Ridge. Albemarle, Bath, Highland, Montgomery, Page, and Rockingham counties.

38. *Nadabius pullus* (Bollman, 1887)

This is one of the commonest lithobiids in eastern United States, and is statewide in Virginia: Albemarle, Alleghany, Buchanan, Campbell, Floyd, Grayson, Henry, Highland, Lunenburg, Montgomery, Patrick, Pittsylvania, Roanoke, Rockbridge, Rockingham, Smyth, and Wythe counties, and the city of Virginia Beach.

[*Nadabius saphes* Chamberlin, 1940]

Described from Duke Forest, Orange-Durham counties, NC, and possibly occurs in southside Virginia.

[*Nampabius carolinensis* Chamberlin, 1913

Recorded from Duke Forest, NC, thus a possibility for Virginia.

[*Nampabius inimicus* Chamberlin, 1913

Described from Russellville, Hamblen Co., TN, 24 mi/38 km south of the state line, this nominal species seems likely to occur in Lee and Scott counties, VA.

39. *Nampabius mycophor* Chamberlin, 1940

Described from the Duke Forest. A small series from 6 mi/10 km SE of Martinsville, Henry Co., 30 October 1990 (VMNH) agrees closely with the original description. Material from Lowmoor, Alleghany Co., Va., 21 March 1951 (REC 1237), was tentatively identified by Dr. Crabill as this species.

40. *Nampabius parienus* Chamberlin, 1913

Described from Hot Springs, N.C., and reported by Holsinger & Culver (1988) from Atwell's Tunnel Cave, Smyth Co., Va. (Crabill det.).

[*Nampabius pinus* Causey, 1942]

Described from Duke Forest. It is perhaps not actually referable to this genus.

[*Nampabius tennesseensis* Chamberlin, 1913]

Described from Russellville, TN, therefore likely to occur in Lee, Scott, and Washington counties, VA.

41. *Nampabius turbator* Crabill, 1952

This localized endemic is so far known only from Lowmoor Quarry Cave (the type locality) and Island Ford Cave, both in Alleghany Co., VA.

42. *Nampabius virginiensis* Chamberlin, 1913

The type locality is Natural Bridge, Rockbridge Co., VA. As material was also found by Chamberlin at Unaka Springs, TN, the species presumably occurs in all of southwestern Virginia between these two localities. Males considered to be *virginiensis* were collected 5 mi/8 km north of Oronoco, Amherst Co., VA, on 29 July 1990 (VMNH). This locality is about 16 mi/26 km northeast of Natural Bridge.

[*Paitobius arienus* (Chamberlin, 1911)]

Described from Hot Springs, NC, 50 mi/80 km south of the state line, *arienus* is thus likely to occur in southwestern Virginia.

[*Paitobius carolinae* (Chamberlin, 1911)]

Reported by Chamberlin from Asheville and Hot Springs, NC, and Russellville, TN, this species will probably be found in southwestern Virginia.

[*Paitobius eutypus* Chamberlin, 1940.]

Described from Linville, NC, only 30 mi/48 km south of the Virginia state line.

43. *Paitobius exceptus* Chamberlin, 1922

This nominal species was described from Jackson, Alabama. Material from Tazewell Co., VA (probably Burkes Garden) was identified as *exceptus* by Dr. A. A. Weaver. The large geographic distance betweeen these localities would seem, however, to argue against this identification.

44. *Paitobius naiwatus* (Chamberlin, 1911)

Material from Smyth County, VA, was determined as this species by Dr. A. A. Weaver, who did not return the complete collection data. As *naiwatus* has been recorded by Chamberlin from the Blue Ridge at Linville Falls, NC, presumably it occurs generally in the intervening Mount Rogers area.

45. *Paitobius tabius* (Chamberlin, 1911)

Described from Johnson City, Tennessee. Material from Cave Springs Recreation Area, near Dryden, Lee Co., VA, 20 June 1972, was identified as this species by Dr. A. A. Weaver.

46. *Paitobius zinus* (Chamberlin, 1911)

This species is unique within the genus because of the enlarged prehensors of the male sex, first described by Crabill in 1960. *P. zinus* appears to be statewide in Virginia, with records from Albemarle, Alleghany, Campbell, Floyd, Henrico, Pittsylvania, Rockbridge, York, and Wythe counties. It is sometimes taken in large numbers in pitfall traps. Although Chamberlin recorded *zinus* from a number of localities as far south as Alabama, his description is based only on a female and it seems likely that he did not collect males as the greatly enlarged prehensors could hardly have been overlooked.

47. *Pampibius paitus* Chamberlin, 1922

This localized endemic was described from Unaka Springs, Unicoi Co., TN, and recorded also from Catawba, NC, east of the Blue Ridge. The sole Virginia locality is the third known for the species: Giles Co.: Salt Pond Mountain beyond Mountain Lake, 3800 ft., 3 May

1959, Crabill and Hoffman (USNM).

48. *Serrobius pulchellus* Causey, 1942

Described from Duke Forest near Durham, NC, and recently reported (Hoffman, 1993) from Floyd, Mecklenburg, and Prince Edward counties, Virginia.

49. *Sigibius nidicolens* Chamberlin, 1938

This species was described from a specimen taken in a bird's nest at Harrisonburg, Rockingham Co.,Virginia, and has not been subsequently reported.

[*Sigibius starlingi* Causey, 1942]

Described from a single specimen from the Duke Forest, NC.

50. *Sozibius carolinus* (Causey, 1942)

Originally described in the new genus *Pearsobius* from Duke Forest material, this species in the opinion of both Dr. Crabill and Dr. Weaver seems referable to *Sozibius*. Virginia specimens identified by these two specialists have been collected in Floyd and Montgomery counties.

51. *Sozibius pennsylvanicus* Chamberlin, 1922

Specimens from Blacksburg, Montgomery Co., VA. 11 October 1956 (REC 2145) have been identified as this species by Dr. Crabill.

52. *Sozibius providens* (Bollman, 1887)

This species has been recorded from an extensive range in the Central Plains states, and from as close to Virginia as Russellville, TN. Dr. Crabill identified several samples (USNM) from the vicinity of Blacksburg, Montgomery Co., Virginia, as referable to *providens*.

53. *Sozibius tuobukus* (Chamberlin, 1911)

Described from Hot Springs, NC, this species has a wide range in the southern Appalachians: NC, TN, SC, KY, WV, and VA. Virginia counties of record are Bland, Giles, and Roanoke.

[*Tidabius suitus* (Chamberlin, 1911)

Recorded from New Jersey, North Carolina, and Alabama, this species should be expected to occur likewise in Virginia.

54. *Tidabius tivius* (Chamberlin, 1911)

Collected by Chamberlin at Lynchburg, Campbell Co., and Balcony Falls, Rockbridge Co., VA. The very wide distribution of this nominal species suggests that it may be synanthropically dispersed.

55. *Typhlobius caecus* (Bollman, 1888)

Originally described from a single female found in Jefferson Co., Tennessee, this pallid and eyeless species has been recorded also from single sites in North Carolina and Alabama. These records are probably based on other, undescribed species, however. A male that probably is *caecus* was found in Rimer Cave, about 5 mi/8 km west of Ewing, Lee Co., Virginia, 19 May 1993, D. A. Hubbard (VMNH). Whether *caecus* is congeneric with the Californian type species of *Typhlobius* is currently under investigation.

Order Scutigeromorpha

In many ways, scutigeromorphs are the most disjunct of chilopods, set off by the middorsal location of the spiracles, multiple subdivision of the tarsi, and large compound eyes. The very long rear legs are used in prey-capture.

Family Scutigeridae

A family of mostly tropical centipeds. Native species occur in southwestern United States; one introduced European species represents the family in most of the country. Scutigerids are never welcomed in the basements of residences, but their presence is a guarantee that cockroaches will not occupy the same premises. Specimens may be captured with all legs intact by the simple device of placing a large water glass against a basement wall — water need not be added.

56. *Scutigera coleoptrata* (Linnaeus, 1758)

A West Palearctic species long ago introduced by commerce into North America and now almost continent-wide in urban situations. It is now acclimatized in Virginia and found well away from dwellings throughout the year. It is statewide in Virginia although represented by only a few actual museum specimens from Alleghany, Henry, Pulaski, Rockingham, and Wythe counties.

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A Pleasing Lacewing, *Nallachius americanus* (McLachan), from Southwestern Virginia (Neuroptera: Dilaridae)

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During 1994 I operated a Malaise trap in a tract of mixed hardwoods near my home in Blacksburg, Virginia, to collect asilid and syrphid flies. One of the most exciting captures, however, was neither of these flies, but a peculiar little moth-like neuropteran. This insect is about 6 mm in length with a wingspan of about 13 mm; the body is reddish-brown except for the abdomen which is bright green. The antennae are pectinate and the membranous wings rather hairy like those of caddis flies.

With the assistance Dr. Kevin Hoffman (Clemson University) I was able to identify the specimen as a male of *Nallachius americanus* (McLachan), family Dilaridae. This species is one of only three dilarids known from North and Central America, and is the only one recorded from eastern United States (Table 1).

Dilarids ("pleasing lacewings") are a group of rarely collected planipennian Neuroptera most easily recognized by the distinct pectinate antennae of males, a feature that is uncommon in this order. Adults are most often collected on or in close proximity to dead trees. For many years most of what was known about the biology of dilarids came from collection data associated with captured specimens. Although the group is still poorly known, *N. americanus* is probably one of the most thoroughly studied of its species. Like most other dilarids, it is found in woody habitats. The life cycle is completed in one year. Adults, which emerge during spring and early summer, are known to engage in mating swarms. Steyskal (1944) captured over 20 adults, mostly males, flying around a dead tree in Michigan. Females of *americanus* possess a well-developed, flexible, ovipositor and lay their eggs in crevices in dead trees, most frequently tulip poplar (*Liriodendron tulipifera*) and several species of oaks (*Quercus*) (MacLeod & Spiegler, 1961). Larvae are often found in the galleries of wood-boring beetles, and were noted by MacLeod & Spiegler (1961) to feed on larvae of the cerambycid *Elaphidion* sp. and the cucujid *Cucuius clavipes* Fabricius, and eggs and larvae of the ant *Camponotus castaneus* (Latreille). Larvae of *americanus* have also been found in close proximity to numerous other wood-inhabiting insect larvae (and potential prey) such as buprestids, curculionids, xylophagids, and cerambycids.

The recently collected specimen carries the data: Virginia: Montgomery Co.: Hethwood woods at Blacksburg, 10 July 1994, Malaise trap (T. P. Kuhar, 1 male). It has been deposited in the Virginia Tech branch of the Virginia Museum of Natural History, Blacksburg, Va. This record represents the first reported capture of *N. americanus* in southwestern Virginia. Other collections

Table 1. Distributional records of the genus *Nallachius* Navas in North and Central America

Species	Geographic distribution
N. americanus (McLachlan)	Puerto Rico; Venezuela; United States: District of Columbia, Florida, Georgia, Indiana, Kentucky, Maryland, Michigan, Pennsylvania, South Carolina, Texas, Virginia (Gurney 1947, MacLeod & Spiegler 1961, Adams 1970, Lawson & McCafferty 1984, Hoffman 1990)
N. championi (Navas)	Guatemala (Adams 1970)
N. pulchellus (Banks)	Cuba; Costa Rica; United States: Arizona (Alayo 1968, Adams 1970, Hoffman 1990)

from the state (all USNM) are from: **Clarke Co.:** Blandy Experimental Farm, 1 male, 1-14 July 1993; 1 female, 25 June-5 July 1994; 1 female, 6-19 July 1994 (all from Malaise trap, D. R. Smith). **Essex Co.:** 1.6 km SE Dunnsville, 1 male, 10-23 June 1993; 3 males, 10-27 June 1993; 1 male, 11-21 1994; 1 male, 2-15 July 1994 (all Malaise trap, D. R. Smith. **Fairfax Co. :** 6.4 km NE of Falls Church, 1 male (allotype), 24 May 1939, W. H. Anderson; Langley, 1 larva with bark of tree, 1 November 1939, W. H. Anderson.

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First Virginia Record for an Adventive Spittlebug, *Neophilaenus lineatus* (Homoptera: Cercopidae)

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Neophilaenus lineatus (L.) is a common Old World spittlebug whose life history and population dynamics on grasses and rushes are well known in Great Britain (Whittaker, 1965 a,b). The first valid record from the Nearctic Region was New York in the late 1880s (Lintner, 1888). Considered adventive in North America (Hamilton, 1979), *N. lineatus* has been referred to as the grass-feeding spittlebug (or froghopper) (e.g., Osborn, 1916; Garman, 1921) or the lined spittlebug (e.g., Hamilton, 1982); the latter is the common name recognized by the Entomological Society of America. This univoltine cercopid overwinters in the egg stage and is often abundant in lush meadows, seepage areas, and wet prairies on orchardgrass (*Dactylis glomerata* L.), redtop (*Agrostis gigantea* Roth.), timothy (*Phleum pratense* L.), and other grasses (Osborn, 1916, 1939; Garman, 1921; Hanna & Moore, 1966; Hanna, 1970).

The North American distribution of this spittlebug has been regarded as distinctly northern (Hamilton, 1979, 1982). It is known from numerous localities in eastern Canada, from the Maritime Provinces to Ontario, and is present in British Columbia and perhaps Alberta in the West. In the United States it has been recorded from Maine south to Pennsylvania and New Jersey (Metcalf, 1962; Hamilton 1979, 1982). *Neophilaenus lineatus* has been confused with the native cercopid *Philaenarcys bilineata* (Say), and early records from Colorado, Minnesota, Missouri, New Mexico, and North Dakota apparently are based on misidentifications. From *P. bilineata*, *N. lineatus* can be distinguished by its narrow forewings with simple (rather than reticulate) venation (Baker, 1897; Hamilton, 1979, 1982).

Here I give Virginia as a new state record; the following localities become the southernmost known for *N. lineatus* in the United States: Page Co., near Big Meadows, Skyline Drive, Shenandoah National Park, elev. c. 3500 ft., 7 August 1994 (AGW); Rockingham Co., Rader Mountain, near Laurel Run and West Virginia state line, George Washington National Forest, elev. c. 3600 ft., 25 June and 6 August 94 (AGW). Adults were common on timothy and other grasses at both localities, and voucher specimens have been deposited in the Cornell University Insect Collection, Ithaca, New York.

The occurrence of *N. lineatus* in relatively undisturbed mountain meadows in Virginia might suggest that this cercopid is indigenous to North America. Many grass-and sedge-feeding insects of northern distribution are indeed naturally Holarctic (Wheeler & Henry, 1992 and references therein). But this spittlebug belongs to a genus that is strictly Palearctic; generally occurs within a 500-km radius of major North American ports (rather than showing a transarctic or transboreal distribution typical of Holarctic species); and is apparently absent from Alaska, Yukon Territory, Chukotka, Magadan Province, Kamchatka, and extreme northern Yakutia (Metcalf, 1962; Hamilton, 1979, 1982), Beringian areas typically occupied by true Holarctic species (see Wheeler & Henry, 1992). Although *N. lineatus* may be found on native grasses (Osborn, 1922), it has been recorded most often from various introduced grass species (Osborn, 1916, 1939; Garman, 1921; Putman, 1953; Hardee et al., 1963). In addition, *N. lineatus* was collected in Rockingham Co. with various clear-cut adventive hemipterans, including the leafhopper *Athysanus argentarius* Metcalf (Hamilton, 1983) and the mirid *Megaloceroea recticornis* (Geoffroy) (Wheeler & Henry, 1992). Evidence suggests that this cercopid is an immigrant species in the New World and is a relatively recent addition to the fauna of Virginia.

Acknowledgments

I thank E. R. Hoebeke (Department of Entomology, Cornell University, Ithaca, NY) for confirming my identification of *N. lineatus*, providing copies of several papers, and for reviewing the manuscript.

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The Fairfax Stone

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In the summer of 1736, Colonel William Mayo and his party faced a decision at the fork of a stream. Sent up river by Lord Fairfax and Virginia's Lieutenant-Governor William Gooch to locate "the true meridian of the first fountain of the river Pattowmack," they were charged with establishing the northwestern corner of the Fairfax Grant. Upon arrival at a point some 16 miles east of modern Cumberland, Maryland, they had to choose whether to continue straight ahead along a channel later named the North Branch or to veer left up what is now called the South Branch of the Potomac River. Based on their snapshot view of the natural history of this location, they opted to continue westward.

Unknown and unknowable to them, their choice of which fork to ascend was to determine the boundary between two states, influence the boundary locations among three others, and foster litigation lasting into the Twentieth Century. Only in 1909 did the U.S. Supreme Court decree once and for all that the North Branch marked the southern border of Maryland (Lassen, 1976). This was long after the Colonial Virginia land grant they were surveying was partitioned between two states, among more than a dozen counties, and into hundreds of plantations, farms, and villages.

As a general geographic rule, a river's name and all that pertains to it follow the larger tributary at any confluence. A major exception to this rule resulted when the Mississippi River was named near its headwaters before French explorers discovered the larger Missouri and Ohio rivers joined it further downstream. Although all the Potomac tributaries above its tidal reaches carried Indian names (the South Branch was Wappacomo while the North Branch and the main stem above Harpers Ferry was Cohaungoruton), their locations and relative sizes were but vaguely perceived in 1736 (Everstine, 1946).

Captain John Smith's 1612 map of Virginia shows "Chesapeack Bay" and the "Patawomeck flu" fairly well in its tidal part, but with somewhat less accuracy from its falls to a fork probably at present Harpers Ferry and with nothing further upstream. Augustin Herrman's 1673 map of Virginia and Maryland is almost modern in its portrayal of tidal "Potowmeck River" but rather schematic for both forks of the Shenandoah and for the Potomac west of Harpers Ferry. Delisle's c.1734 map of "La Louisiane" shows the present Ohio, Cumberland, and Tennessee rivers rising on the west side of a single Appalachian "ridge" with two forks each for the Shenandoah and Potomac rivers rising to the east (Fite & Freeman, 1926). Modern maps reveal Delisle's single "ridge" to be a complex of several ridges and valleys with tributaries of the James River separating the Shenandoah headwaters from those of all streams draining westward.

Even the meaning of "first fountain" as proclaimed by King James II to denote headwaters was open to interpretation, which may have influenced the decision of the Mayo party. With the full extent of the North American continent then as unknown to Virginia colonists as it was to English royalty, "first" could equally well have meant "westermost" as "hindermost" in the political climate of the times. Colonel Mayo and his party may have been predisposed to continue westward up the Cohaungoruton rather than to turn aside up the Wappacomo with but the slightest justification.

A possibility exists that rainfall in the watershed of the North Branch in the summer of 1736 could have swollen its flow to give it a temporary appearance of being the major tributary. Indeed, during the drought year of 1969 the South Branch did have the lower average flow. Even when flow from the two branches is approximately equal, from a downstream approach the North Branch appears to continue onward while the South Branch diverges obliquely to the side. Which branch appears as the major one is thus subject to vagaries of weather and first impressions; any snapshot view at this confluence stands a good chance of supporting the wrong conclusion.

Although high river water in spring is typically

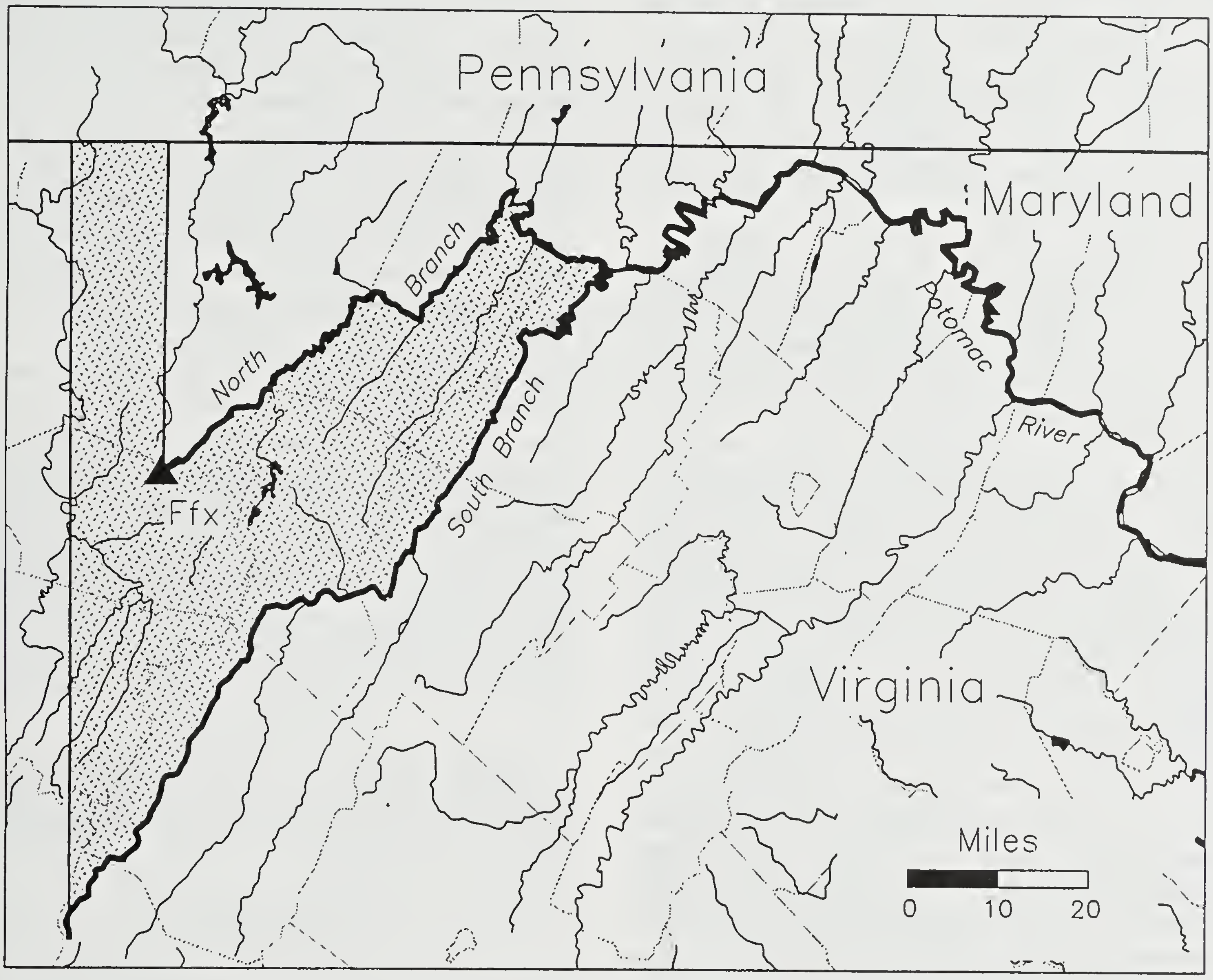

Figure 1. The shading shows the area that would have been lost to Virginia and claimed by Maryland had the Mayo party followed the South Branch of the Potomac River to its "first fountain." Ffx is the location of the Fairfax Stone. (Elizabeth Campbell, Virginia Division of Mineral Resources, assisted in the electronic preparation of the map.)

followed by low water in summer, floods and droughts may be weighed on the basis of their statistically expected repeat frequency – 5 years, 50, or 500. While deciduous trees leaf in the spring and shed in the fall, defoliating "locust" (=cicada, *Magicicada septemdecim*) infestations tend to repeat every 17 summers. North American snowshoe hare (*Lepus sp.*) populations along with those of their major predator, the lynx (*Lynx* sp.), peak and crash at about 10-year intervals, their numbers varying by as much as one full order of magnitude in their cycle. Any snapshot observation about the natural history of a given place and time may or may not represent an average or typical state of its systems; in all probability it does not.

As a result of accurate surveying in the Nineteenth Century and the aerial and satellite imagery of the Twentieth, we now know the South Branch is the longer of the two and has the larger watershed. The South Branch extends 133 miles upstream from the confluence and drains 1493 square miles whereas the North Branch extends only 97 miles and drains 1328 square miles. Based on data collected by the U.S. Geological Survey since 1899, the mean annual discharge of the South Branch is 1310 cubic feet per second whereas that of the North is but 1277. Daily flows, however, range 10–100 times larger or smaller than these mean values. Acquiring these numbers required decades of careful measurement and diligent observation by the Survey, the U.S. Army Corps of Engineers, and the Interstate Commission on the Potomac River Basin.

Colonel Mayo and his party were dispatched to discover the headwaters of the Potomac because in 1688 King James II bequeathed Thomas (Lord) Culpeper all the land between the Potomac and Rappahannock rivers to a line to be drawn between their first fountains. Lord Fairfax inherited this bequest and, in 1746, the western boundary of his tract, the Fairfax Line, was surveyed between those two headwaters. The Fairfax Stone, a block of native sandstone engraved "Ffx," was planted at its northwestern end, the headwaters of the North Branch. This stone was subsequently taken to designate the southwestern corner of Maryland as shown on Thomas Kitchin's 1755 map of the British and French dominions in North America (Fite and Freeman, 1926).

It was not until 1771, when Colonel Thomas Cresap surveyed both branches of the Potomac, that its first fountain was finally located in present Highland County, Virginia, on a meridian some 12 miles west of the Fairfax Stone and 52 miles south of it. Thus, the headwaters of the South Branch are both the westermost and the hindermost of the Potomac. The Fry-Jefferson map of 1775 accurately shows this relationship along with other major tributaries to the Potomac. Nevertheless, the meridian of the Fairfax Stone marked the western extent of Maryland with the North Branch as its southern border; Colonel Mayo's decision in 1736 at the confluence of the North and South branches of the Potomac binds political boundaries even today.

One can but speculate on subsequent turns of events had Colonel Mayo opted to tack left up the South Branch. All or parts of the counties of Mineral, Grant, Hampshire, Hardy, Pendleton, Preston, Tucker, Randolf, and Pocahontas, now in West Virginia, and the northwestern corner of Highland County would have belonged to Maryland (Figure 1). The whole question of the disposition of the district of West Augusta into northwestern Virginia (now West Virginia), southwestern Pennsylvania, and eastern Ohio could have been decided otherwise, resulting in borders among those states possibly quite different from ones now observed.

Rational planning about how best to use the land we inherit requires us to know what we have and what benefits and constraints it confers upon us. The land, its climate, its surface and subterranean waters, the plants that grow in and on it, and the animals that inhabit it require long-term observation before any rational planning is credible. Permanent and continuing geological and biological surveys, such as those conducted by the Virginia Division of Mineral Resources and the Virginia Museum of Natural History, are an absolute requirement for obtaining the baseline information needed for land-use decisions.

Any snapshot of these characteristics is likely to produce an inaccurate picture of the lay of the land. Once a wrong turn is made, however, rectification of its consequences ranges from difficult to impossible. The Fairfax Stone does not lie at "the first fountain of the river Pottowmack," but we are stuck forever with the after effects of Colonel Mayo's decision made in 1736 where the North and South branches join to become the main stem of the Potomac River.

Acknowledgments

Data for the Potomac River were kindly provided by Curtis M. Dalpa of the Interstate Commission on the Potomac River Basin.

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The Elm Leafminer, *Kaliofenusa ulmi* (Sundevall) (Hymenoptera: Tenthredinidae) in Virginia, and Summary of Host Records

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The elm leafminer, *Kaliofenusa ulmi* (Sundevall), also in the literature as *Fenusa ulmi* Sundevall, is of European origin and was accidentally introduced into North America, apparently toward the end of the nineteenth century. The first North American record is from New York (Felt, 1898a, b). It has since been recorded from Massachusetts, Michigan, Ontario, and Quebec (Smith, 1971).

From observations and collections from 1991 through 1994 at the University of Virginia Blandy Experimental Farm and the State Arboretum of Virginia, Clarke Co., Virginia, *K. ulmi* was discovered damaging an elm in the Arboretum and specimens were collected in a nearby 90-year old woodlot composed primarily of oak, elm, and hickory. This is the southernmost occurrence of the elm leafminer in the United States, the first record from Virginia, and the elm species, *Ulmus elliptica*, is a new host record for the sawfly.

Adult.– *Kaliofenusa ulmi* adults are small (3.5 - 4.5 mm long) and black (Figs. 1, 2); males are not known. Such a sawfly taken from an elm is undoubtedly this species, but identification should always be verified. The only sawflies that are similar are other leafminers, some *Profenusa* spp. on oak and birch, *Fenusa dohrnii* (Tischbein) on alder, and *F. pusilla* (Lepeletier) on birch. Only *Profenusa alumna* (MacGillivray) on oak has been found in Virginia, and rarely, though the others are probable. See Smith (1971) for separation of *K. ulmi* from other North America species of leafminers and Liston (1993) for separation from other species of *Kaliofenusa*.

Larva.– The larvae are small (when mature about 7.5 mm long), whitish with a slightly darker head capsule, and dorsoventrally flattened. Smith (1971) separated the larva from those of other leafminers.

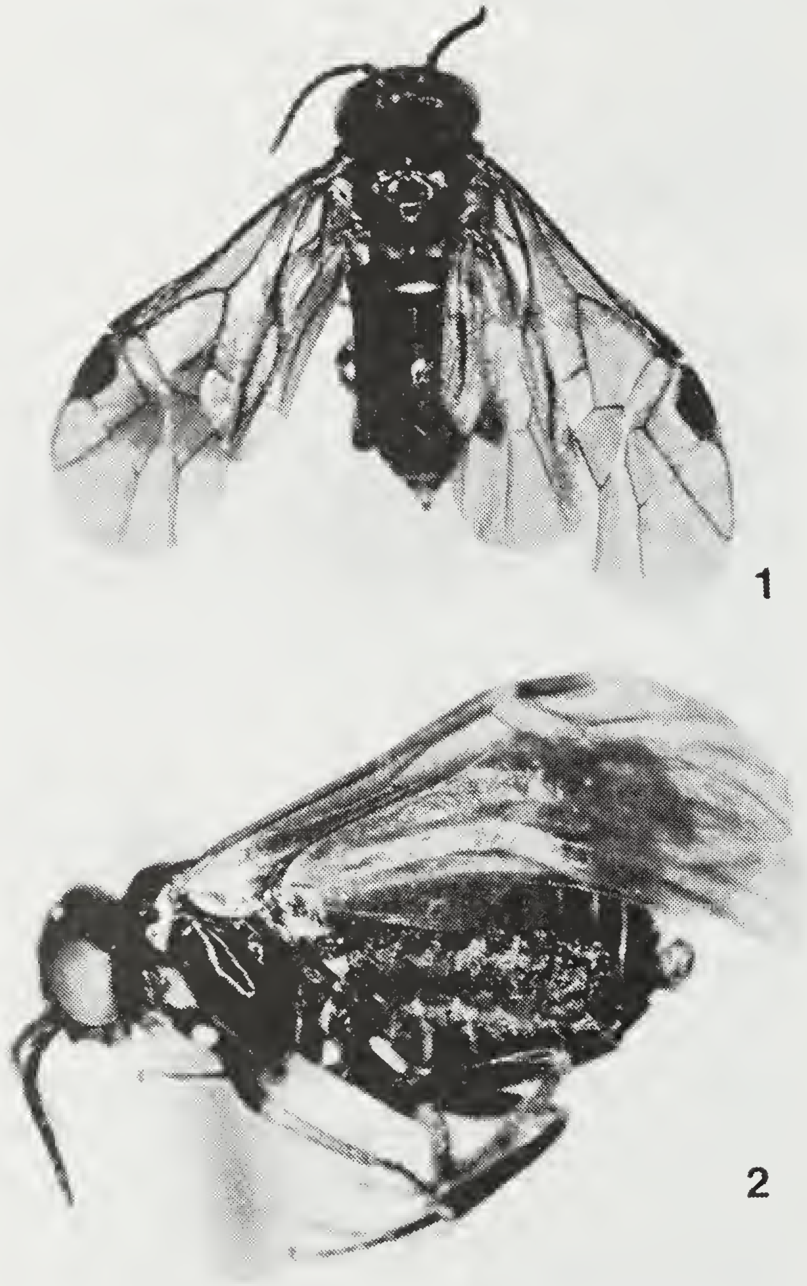
Hosts.– The sawfly is apparently specific to a single species of elm in Europe. Liston (1993) stated that it is probably confined to *Ulmus glabra*. Other species of *Kaliofenusa* in Europe mine leaves of other elms: *K. carpinifoliae* Liston in "*Ulmus minor* Mill. (=*carpinifolia* Gleditsch)," and *K. altenhoferi* Liston in "*Ulmus effus* Willd (= *laevis* Pallas)" (Liston, 1993). All specimens of the leafminer so far collected in North America are *Kaliofenusa ulmi*.

Only one species of elm, Armenian elm, *Ulmus elliptica*, is attacked in the Arboretum. Other species in the elm grove are identified as follows: *Ulmus pumila*, *U. pumila* var. *arborea*, *U. carpinifolia*, *U. glabra*, *U. americana*, and an unidentified species (tagged #84-2759). For five years, I have noticed considerable browning of the single Armenian elm but none of the others, and personnel at the Arboretum have mentioned noticing it for many years. I have collected specimens of *K. ulmi* from this elm and also in Malaise traps in a woodlot about 0.8 km from the elm grove in the Arboretum. The only elm in the woodlot (slippery elm, *Ulmus rubra*) appears to have suffered no damage.

Felt (1898) reported that the "Camperdown" elms in New York were severely attacked, and that the "English, Scotch, and American species" were damaged. He gave no scientific names, and it is not known if he referred to American elm, *U. americana*. Slingerland (1905) recorded the elm leafminer from English and Scotch elms (especially the Camperdown variety) in New York and stated that American elms were immune from attack even where different host species were growing in close proximity.

Since my 1971 revision, I have seen the following host records from labels on North American specimens: *Ulmus americana* from Maine and *U. rubra* from Vermont.

Although *K. ulmi* is apparently specific to one elm species in Europe (Liston, 1993), there are various and contradicting host records in North America. This could be a result of misidentification of host plants and changing nomenclature of the elms (the sawfly may know the elm species better than we do), the possibility that the sawfly has become adapted to other elm species in North America, or there are other interacting factors, environmental or physiological, that make the trees susceptible to attack.



Figs. 1, 2. *Kaliofenusa ulmi*, adult 1, Dorsal view. 2, Lateral view. Length = 3.5–4.0 mm.

In summary, host information in North America is as follows, with the elm names given as they are identified in the Arboretum or as they appear in the literature:

Ulmus americana L., American elm.– Felt (1898a, b) reported damage to "American species" but Slingerland (1905) stated that "American elms" were immune from attack. Several American elm trees near the Armenian elm in the Arboretum were not attacked. Elm leafminer specimens I have examined from Maine bear the labels "on American elm" and "*Ulmus americana.*"

Ulmus campestris L., English elm.– "English elms" were reported as hosts by Felt (1898a, b) and Slingerland (1905) in New York.

Ulmus carpinifolia Gleditsch, smooth leaf elm.– Not attacked in the Arboretum. This is the host of another species of *Kaliofenusa* in Europe.

Ulmus elliptica Koch., Armenian elm.– The only species of elm in the Arboretum attacked. The sawfly causes severe browning of the tree.

Ulmus glabra Hudson, Scotch elm.– Recorded as the only known host in Europe (Liston, 1993). "Scotch elms" are recorded as hosts by Felt (1898a, b) and Slingerland (1905) in New York. Not attacked in the Arboretum.

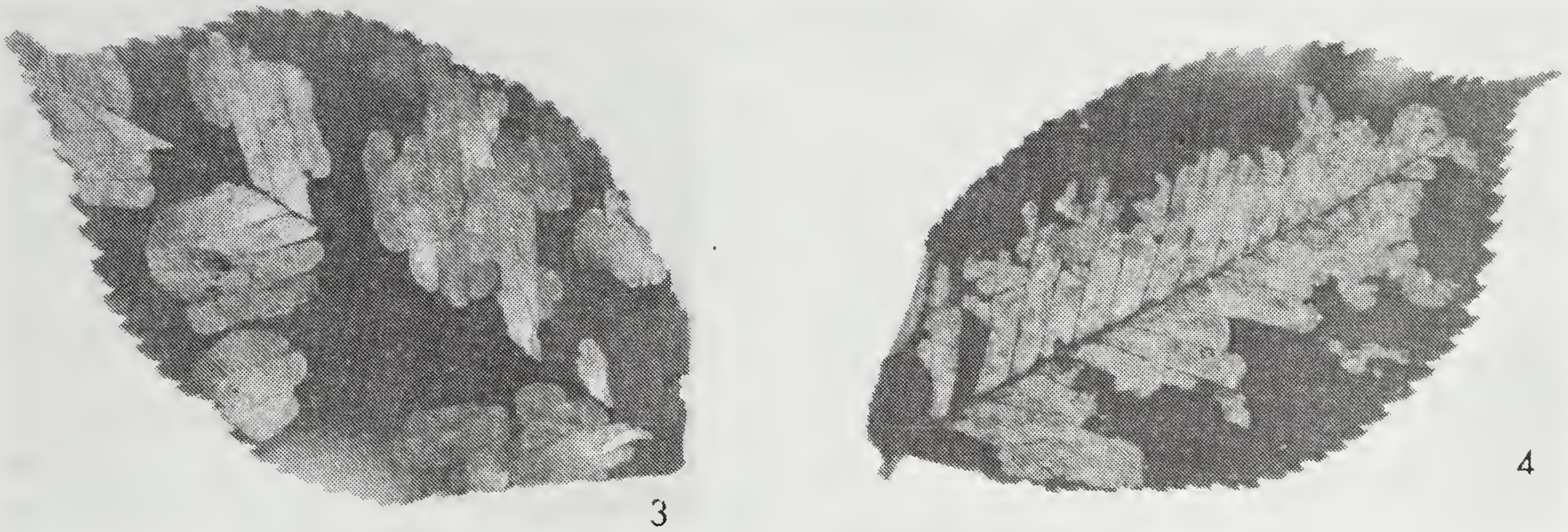
Ulmus glabra var. *camperdownii* Rehd.– Damage was reported by Felt (1898a, b) as "Camperdown" elms, and by Slingerland (1905) on "the Camperdown variety of Scotch elms" in New York.

Ulmus pumila L., Siberian elm.– Not attacked in the Arboretum.

Ulmus pumila var. *arborea* Litwinow.– Not attacked in the Arboretum.

Ulmus rubra Muhl., slippery elm.– This elm is recorded on host labels on specimens from Vermont. Specimens were collected in the woodlot on the Blandy Experimental Farm where this is the only species of elm, but no damage was observed.

Biology.– *Kaliofenusa ulmi* is univoltine. At the Arboretum, adults emerged in late April and early May of each season. They were seen flying and alighting on the host foliage, and many were swept from the grass underneath the tree. In early to mid-May, larvae were actively feeding and forming blotch mines in the foliage. Most mining begins near the midrib of the leaf, and the larvae work laterally toward the leaf edges (Figs. 3, 4). The mines may coalesce and form large blotches. There could be 20 or more mines per leaf. During the last week in May, many of the leaves were completely mined, but



Figs. 3, 4. Leaves of *Ulmus elliptica* from the Virginia State Arboretum showing blotch mines of *Kaliofenusa ulmi*. Mines begin near the midrib and extend outward into the leaf. Length of leaves = ca. 11 cm.

some larvae were still feeding. By the end of May and first of June no larvae were found, and feeding and damage was complete for the year.

My observations coincide with those of Slingerland (1905) who reported on this insect in New York, though I did not observe oviposition and overwintering sites. Emergence dates are slightly later in New York, with adults beginning to emerge in mid-May; they are especially abundant the last part of May. Eggs are inserted into the leaf from the upper surface, usually near the midrib or larger veins. Larvae hatch in about a week and take up to three weeks to develop within the leaf. When mature, the larvae eat through the leaf surface and drop to the ground where they make a small papery cocoon about an inch below the surface. There they remain and transform to adults and emerge the following spring.

Distribution.–I have examined specimens from these states and provinces: Maine, Massachusetts, Michigan, New York, Ontario, Quebec, Vermont, Virginia.

Virginia records.– Clarke Co., University of Virginia Blandy Experimental Farm and State Arboretum of Virginia, 3.2 km S. Boyce, David R. Smith: April 19, 1990 (1 swept from low vegetation in woodlot); April 19-30, 1990, April 16 - 28, 1994, April 29 - May 9, 1994 (specimens in Malaise traps in woodlot); April 27, 1993, May 10, 1993, April 28, 1994, May 9, 1994 (numerous specimens from under Armenian elm in Arboretum).

Acknowledgments

I extend my thanks to Michael Bowers, Ed Connor, and Christopher Sacchi for allowing field work at the the University of Virginia Blandy Experimental Farm and State Arboretum of Virginia. C. F. Sacchi; H. Goulet, Agriculture Canada, Ottawa; and D. R. Miller and R. W. Hodges, Systematic Entomology Laboratory, U.S.D.A., Beltsville, Maryland, and Washington, D.C., respectively, reviewed the manuscript.

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Miscellanea

Announcements

1. Results of Recent VNHS Elections

The results of the fall 1994 election of officers of the VNHS were Vice-President (President-elect) Thomas Rawinski and Councilor Norman Fashing. C. Barry Knisley becomes President for 1995 and 1996.

2. Kudos to the Co-Editors

On 2 February 1995 **Banisteria** Co-editor Richard Hoffman received the Jefferson Award from the Virginia Museum of Natural History Foundation. This award was given in recognition of Richard's long-term contributions to the natural history of Virginia. Simultaneously, on the other side of Richmond, the Virginia Chapter of the Wildlife Society presented its Professional Award to Co-editor Joseph Mitchell "in recognition of outstanding contributions to wise management of wildlife resources."

3. Appalachian Biogeography Symposium

The first symposium on Appalachian Biogeography was held in 27-29 June 1968 and resulted in three volumes covering the flora, invertebrates, and vertebrates of the region. A second symposium designed to update this topic is being organized for 25-29 June 1995 by Ralph P. Eckerlin and others. About 35 papers on a wide variety of topics will be presented. Those interested in attending should contact Dr. Eckerlin, Natural Sciences Division, Northern Virginia Community College, 8333 Little River Turnpike, Annandale, VA 22003-3796 (703-323-3234, FAX 703-323-3215). A proceedings of the symposium will be published.

4. Wintergreen Natural History Weekend

The 5th annual Wintergreen Natural History Weekend will be held 15-17 September 1995 (Friday evening through Sunday afternoon) at Wintergreen Resort. Some 16-17 biologists, anthropologists, and geologists will present a wide variety of slide lectures and field trips covering many aspects of Virginia's natural history. Over 120 people attended the stimulating but relaxed event in 1994. This is the only event available that covers the natural history of the Commonwealth in the broad sense. Anyone interested in attending, as well as potential instructors, should contact Doug Coleman, Wintergreen Resort, Box 706, Wintergreen, VA 22958 (804-325-2200, ext. 992).

5. Forthcoming Meetings

Association of Southeastern Biologists - 19-21 April 1995, University of Tennessee, Knoxville. Contact Dr. James D. Caponetti, Dept. of Botany, University of Tennessee, Knoxville, TN 37996-1100.

Virginia Herpetological Society - 29-30 April 1995, weekend field trip at Ft. A.P. Hill, Caroline County, Contact Bob Hogan, P.O. Box 603, Troutville, VA 24175.

Virginia Society of Ornithology - 5-7 May 1995, Williamsburg, VA; in conjunction with the Wilson Society. Contact VSO, 520 Rainbow Forest Dr., Lynchburg, VA 24502.

VNHS - 25 May 1995, Washington and Lee University, Lexington, VA, with the Virginia Academy of Science. Contact Tom Rawinski, VNHS Vice-President.

6. **Banisteria** is expanding the range of articles contained in its pages. The editors are especially seeking manuscripts on the biographies of people who have contributed to the natural history of Virginia. These articles could be exhaustive descriptions of the person's life and accomplishments, his or her contributions to the natural history of the Commonwealth, or a review of a particular phase in his or her life. Photographs and lists of publications are welcomed. There are few places where historical information about our colleagues is published, and thus we envision that **Banisteria** could fill a long-standing void.

In addition, we are seeking book reviews from anyone who wishes to describe and critique books related in some way to the natural history of Virginia. We are also seeking essays on current issues or subjects pertaining to natural history. Essays can be of any length. The editors reserve the right to seek additional essays on the topic in question so that more than one view can be published. Letters to the editor are also welcomed.

Biographies, book reviews, essays, and letters to the editor should be sent to Joseph C. Mitchell, Department of Biology, University of Richmond, Richmond, VA 23173.

* * *

Information on upcoming meetings, symposia, and other items of interest to members of the Virginia Natural History Society should be sent to the editors.

Instructions for Contributors

Banisteria accepts manuscripts of one to several pages in lengths, that contribute to the public and scientific knowledge of the natural history of Virginia. This publication is intended to be an outlet for information that is useful but would not be accepted in the mainstream journals of many disciplines. Information and data found in field notebooks and files that never made it into scientific journals are especially important. **Banisteria's** focus is classical and therefore slanted toward organismal biology.

Manuscripts should be sent in duplicate to one of the Co-editors, who will assign them to an appropriate Section Editor, who in turn will seek one or two reviews. Reviews of manuscripts written by a section editor will be handled by a different editor. Authors should retain both the original typescript and figures until final acceptance for publication. Photocopies are adequate for review purposes.

Manuscripts must be written on one side of standard size paper (21.5 x 28 cm) using double spacing throughout. Words should not be hyphenated.

Manuscripts should be arranged in the following order: **Title, author's name, author's address, text, acknowledgments, literature cited, tables, figure legends, figures.** Long manuscripts should have standard sections, e.g., Materials and Methods, Results, and Discussion. Short manuscripts (<4-6 manuscript pages) should not have these sections. All pages should be numbered, including tables. The title should be concise but informative. It, and the author's name and address should be centered at the top of the first page. The text should begin on the first page beneath the author's address. Use good judgement on arrangement of sections when other than the standard approach is necessary. Use underlines for species' scientific names.

References: Use the following as a guide. Do not abbreviate journal names.

Journal article with 1 author:
Scott, D. 1986. Notes on the eastern hognose snake, *Heterodon platyrhinos* Latreille (Squamata: Colubridae), in a Virginia barrier island. Brimleyana 12:51-55.

Journal with 2 authors:
Tilley, S. C., & D. W. Tinkle. 1968. A reinterpretation of the reproductive cycle and demography of the salamander *Desmognathus ochrophaeus*. Copeia 1968:299-303.

Journal with 3+ authors:
Funderburg, J. B., P. Hertz, & W. M. Kerfoot. 1974. A range extention for the carpenter frog, *Rana virgatipes* Cope, in the Chesapeake Bay region. Bulletin Maryland Herpetological Society 10:77-79.

Book:
Harris, L. D. 1984. The Fragmented Forest. University of Chicago Press, Chicago, IL. 211 pp.

Chapter in a book:
Gentry, A. H. 1986. Endemism in tropical versus temperate plant communities. Pp. 153-181 *In* M. Soule (ed.), Conservation Biology. Sinauer Associates, Inc., Sunderland, MA.

Report:
The Nature Conservancy. 1975. The preservation of natural diversity: A survey and recommendations. Report to the U.S. Dept. of Interior, Washington, D.C., 189 pp. (include report series and number if present).

Tables: Each table should be typed on a separate sheet of paper. A legend for each table should follow the number and must be on the same page as the table. Ruled, horizontal lines should be avoided except at the top and bottom of the table.

Figures: Black-and-white line drawings are acceptable for publication. They should be less than 21.5 x 28 cm in size. The back of each figure should be labeled with the author's name.

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Abbreviations: The following are common abbreviations accepted in **Banisteria**:
$\bar{x}$ (mean), n (sample size), no. (number), SVL (snout-vent length; define on first usage), yr (years), mo (months), wk (weeks), h (hours), min (minutes), s (seconds), P (probability), df (degrees of freedom), SD and SE (standard deviation and standard error), NS (not significant), l (liter), g (grams), mm (millimeter), C (degrees Celcius). Do not abbreviate "male" or "female", or dates, or undefined terms.

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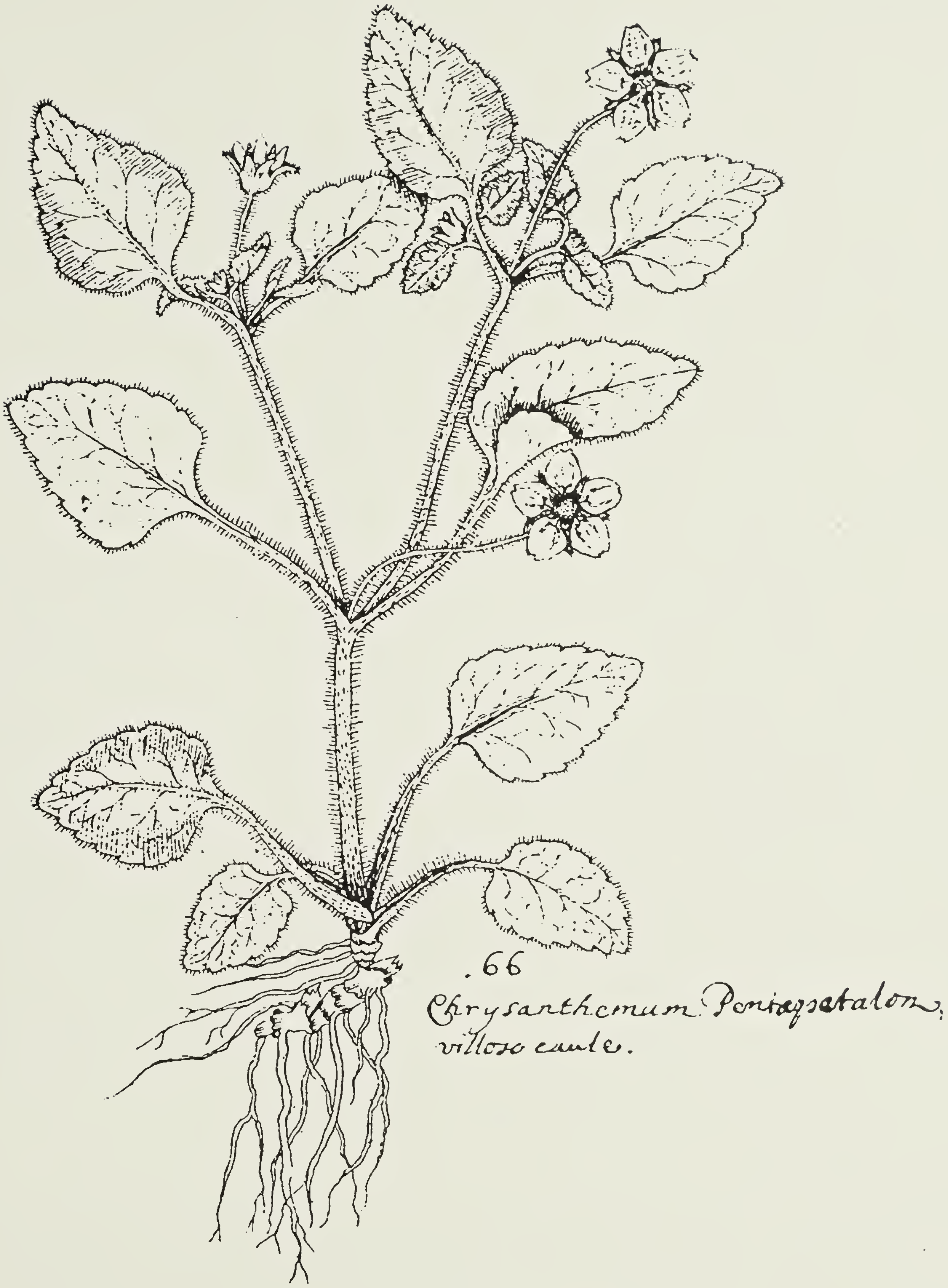

Chrysogonum virginianum Linnaeus

Original drawing by John Banister. Figure 83 in folio in Hans Sloane's MS 4002 in the British Museum. Photocopy courtesy of Joseph and Nesta Ewan.